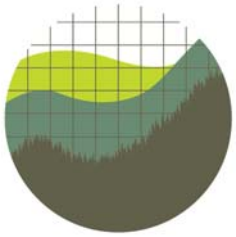

Institute *for*
Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

February 26, 2018

VIA ELECTRONIC SUBMISSION

Attn: Dr. Nick Hutson, Energy Strategies Group, Sector Policies and Programs Division (D243-01), U.S. Environmental Protection Agency, Research Triangle Park, NC 27711

Subject: Advance Notice of Proposed Rulemaking on State Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units, 82 Fed. Reg. 61,507 (Dec. 28, 2017)

Docket No. EPA-HQ-OAR-2017-0545

The Institute for Policy Integrity at New York University School of Law[1] ("Policy Integrity") respectfully submits the following comments on the Environmental Protection Agency's ("EPA") Advance Notice of Proposed Rulemaking on State Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units. Policy Integrity is a non-partisan think tank dedicated to improving the quality of government decisionmaking through advocacy and scholarship in the fields of administrative law, economics, and public policy.

EPA requests comment on "how best to define the B[est] S[ystem of] E[mission] R[eduction] and develop emission guidelines" in a possible replacement rule for the Clean Power Plan.[2] There is, however, no compelling legal or economic case for repealing the Clean Power Plan or deviating from its flexible design.

I. The Clean Power Plan Is a Permissible Exercise of EPA's Rulemaking Authority Under Section 111 of the Clean Air Act

Section 111 of the Clean Air Act places several important limits on EPA's discretion to craft emission guidelines for existing sources, such as forbidding the agency from imposing excessive costs, requiring it to consider how its guidelines might affect the nation's energy supply, and requiring it to base guidelines on reduction techniques that have been "adequately demonstrated." As discussed in our report *Bounded Regulation*, attached to this letter as **Exhibit A,** EPA rigorously observed all of Section 111's constraints when crafting the Clean Power Plan.

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[1] No part of this document purports to present New York University School of Law's views, if any.

[2] 82 Fed. Reg. at 61,513.

II. The Clean Power Plan Is Consistent with Regulatory Precedent

EPA suggests that a permissible BSER under Section 111 can encompass only technological or operational changes implemented within the fenceline of an individual source. But the agency has previously promulgated several rules—under Section 111 and other provisions of the Clean Air Act—that incorporate beyond-the-fenceline strategies for reducing emissions. In a number of these rulemakings, beyond-the-fenceline reduction techniques were used not only as a compliance mechanism, but also to determine the stringency of the relevant emission limits, sometimes justifying more stringent restrictions than would otherwise have been imposed. For further discussion of these precedents, see our article *Familiar Territory*, attached to this letter as **Exhibit B.**

III. The Clean Power Plan Is Cost-Benefit Justified

When it issued the Clean Power Plan in 2015, EPA prepared an extensive Regulatory Impact Analysis and projected that the rule's climate and health benefits would greatly outweigh its compliance costs. Since that time, changes in the electric sector have made it even cheaper to meet the rule's emission targets than EPA originally anticipated. As a result, more recent analyses by independent groups have estimated substantially lower compliance costs than EPA did. For further discussion of these independent analyses, see our report *The Falling Cost of Clean Power Plan Compliance*, attached to this letter as **Exhibit C.**

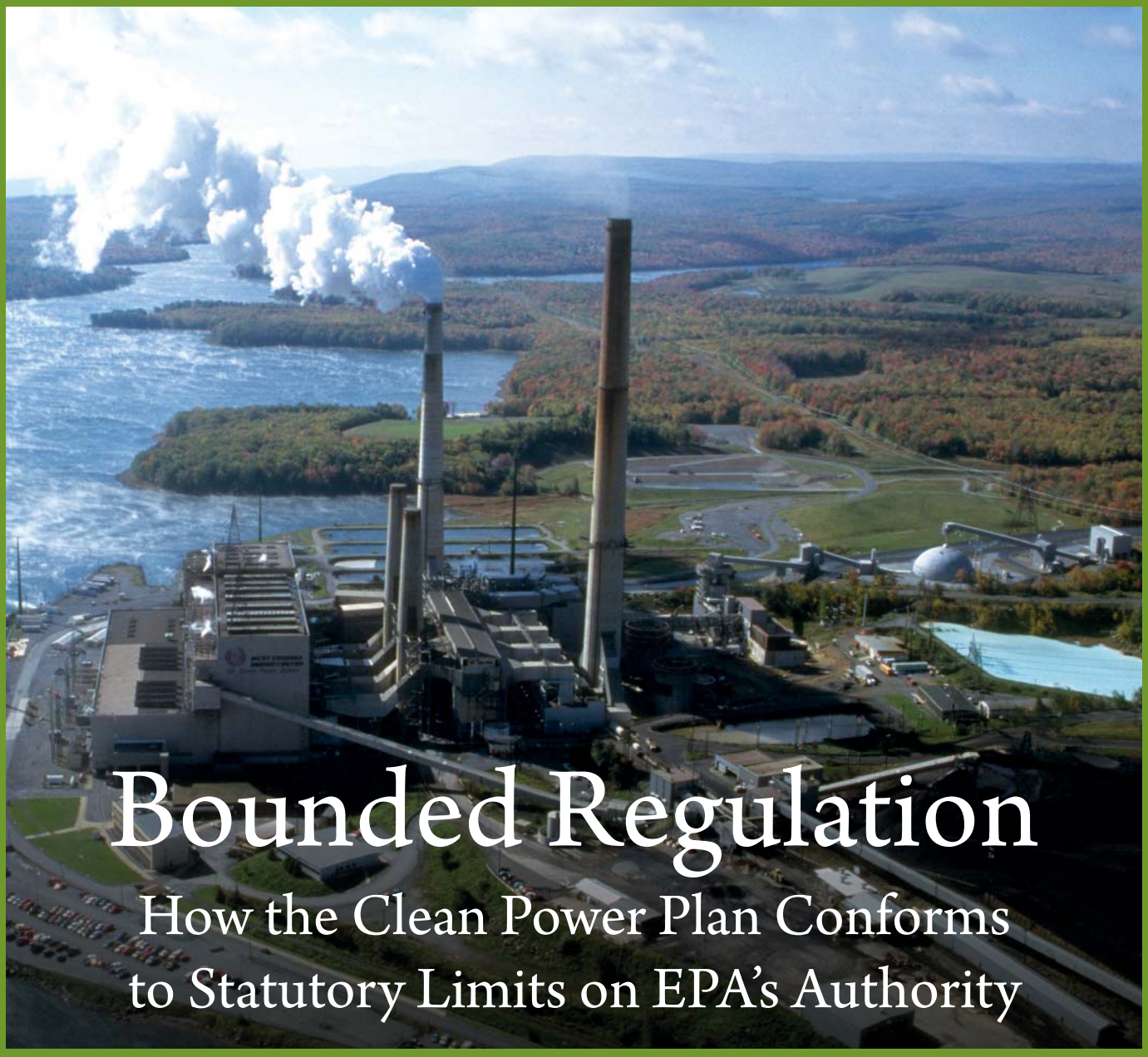
For all of these reasons, as EPA considers the development of new emission guidelines for fossil fuel-fired power plants under Section 111(d), it should retain the flexible approach to reducing greenhouse gas emissions that it adopted in the Clean Power Plan.

Respectfully,

Denise A. Grab
Jack Lienke
Jason A. Schwartz
Avi Zevin

Institute for Policy Integrity
New York University School of Law

Attachments



Bounded Regulation

How the Clean Power Plan Conforms to Statutory Limits on EPA's Authority

Institute *for* Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

September 2016
Richard L. Revesz
Denise A. Grab
Jack Lienke

I. Introduction

The Clean Power Plan is the first federal regulation aimed at reducing carbon dioxide (CO_2) emissions from existing power plants, the nation's largest source of greenhouse gas pollution.[1] Expected to reduce the power sector's annual CO_2 output to 32% below 2005 levels by 2030,[2] the Plan is widely viewed as a significant, but eminently achievable, step to address the United States' contribution to global climate change.[3]

Critics of the Plan, however, argue that, in its pursuit of substantial emission reductions, the Environmental Protection Agency (EPA) "dramatically overstepped its authority" under the Clean Air Act[4] and invaded regulatory arenas—intrastate electricity markets—that have traditionally been managed by the states.[5] They accuse the agency of attempting to "fundamentally restructure the nation's electricity industry" and position itself as "the nation's energy czar."[6]

It is certainly true that EPA's regulatory authority over existing power plants is not boundless. Indeed, Section 111 of the Clean Air Act places several important limits on the agency's discretion to craft emission guidelines for such facilities, such as forbidding the agency from imposing excessive costs, requiring it to consider how its guidelines might affect the nation's energy supply, and requiring it to base guidelines on reduction techniques that have been "adequately demonstrated."[7] But critics are wrong to suggest that the Clean Power Plan represents a "dramatic overstepping" of these statutory boundaries.[8] Instead, as this policy brief will discuss, the Plan explicitly acknowledges and respects each of Section 111's constraints on EPA's regulatory authority.

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1 EPA, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Final Rule, 80 Fed. Reg. 64,662, 64,663 (Oct. 23, 2016); *see also* EPA, Learn About Carbon Pollution From Power Plants, https://www.epa.gov/cleanpowerplan/learn-about-carbon-pollution-power-plants (last visited Sept. 1, 2016) (noting that the electric power sector was the largest source of U.S. greenhouse gas emissions as of 2012).

2 80 Fed. Reg. at 64,665.

3 *See, e.g.*, President Barack Obama, Remarks by the President in Announcing the Clean Power Plan (Aug. 3, 2015), https://www.whitehouse.gov/the-press-office/2015/08/03/remarks-president-announcing-clean-power-plan (calling the Clean Power Plan "the single most important step America has ever taken in the fight against global climate change"); Envtl. Def. Fund, A New National Clean Power Plan, https://www.edf.org/climate/a-new-federal-clean-power-plan (last visited Sept. 1, 2016) (referring to Plan as the "most significant step in U.S. history toward reducing the pollution that causes climate change"); M.J. Bradley & Associates, EPA's Clean Power Plan: Summary of IPM Modeling Results with ITC/PTC Extension 3 (June 1, 2016) (finding that Plan's "targets are achievable under a range of scenarios and assumptions"); Brief of Amici Curiae Former State Envtl. & Energy Officials in Supp. of Resp'ts 1, West Virginia v. EPA, No. 15-1363, Doc. No. 1606746 (D.C. Cir. Apr. 1, 2016) (explaining that Plan's "targets are quite modest given strong positive trends in the power sector").

4 George Russell, *Business, States Open Legal Fire on EPA's Clean Power Plan Rule*, FoxNews.com (Oct. 26, 2015), http://www.foxnews.com/politics/2015/10/26/business-states-open-legal-fire-on-epas-clean-power-plan-rule.html (quoting executive director of the National Federation of Independent Business's Small Business Legal Center).

5 *See* Opening Br. of Pet'rs on Core Legal Issues 36–41, West Virginia v. EPA, No. 15-1363, Doc. No. 1610010 (D.C. Cir. Apr. 22, 2016).

6 William S. Scherman, *EPA Has Designed Its Clean Power Plan to Evade Court Review*, Forbes (Aug. 3, 2015), http://www.forbes.com/sites/beltway/2015/08/03/epa-has-designed-its-clean-power-plan-to-evade-court-review.

7 *See infra* pp. 3-4.

8 Alan Neuhauser, *EPA to Issue Carbon Rules by Summer*, U.S. News & World Rep. (Jan. 7, 2015), http://www.usnews.com/news/articles/2015/01/07/epa-to-complete-clean-power-plan-carbon-rules-by-summer (quoting CEO of the Pennsylvania Coal Alliance).

II. Regulating Existing Stationary Sources of Pollution Under Section 111(d)

Section 111 requires EPA to establish "standards of performance" for stationary source categories that "contribute[] significantly to . . . air pollution which may reasonably be anticipated to endanger public health or welfare."[9] Frequently, EPA promulgates such standards only for new sources, under Section 111(b). However, when the pollutant in question is neither a so-called "criteria" pollutant, like particulate matter, nor a "hazardous" pollutant, like mercury, standards must also be established for existing sources, under Section 111(d).[10] Greenhouse gases like CO_2 fall into the narrow category of non-criteria, non-toxic pollutants subject to Section 111(d) regulation.

While Section 111 standards for new sources are established directly by EPA, existing-source standards are established by states, subject to minimum guidelines and oversight from EPA. More specifically, Section 111(d) instructs the agency to "establish a procedure . . . under which each State shall submit to the [EPA] Administrator a plan which . . . establishes standards of performance for any existing source."[11] These state-established standards must reflect "the degree of emission limitation achievable through the application of the best system of emission reduction which . . . *the [EPA] Administrator* determines has been adequately demonstrated."[12] In other words, even though EPA is not, in the first instance, charged with implementing existing-source standards, it is responsible for determining their minimum stringency.[13]

Accordingly, EPA begins the process of standard-setting under Section 111(d) by issuing "emission guidelines" for states, which identify: (1) what the agency considers the best system of emission reduction for the given pollutant and source category, (2) the level of emission reduction achievable using that system, and (3) the time necessary to achieve that reduction.[14] Each state then has the opportunity to design an individual plan to impose standards consistent with EPA's guidelines.[15] Importantly, a state is not required to adopt the particular system of reduction identified by EPA in its guidelines, so long as the state's own approach will achieve an equivalent or superior level of abatement.[16] If a state declines to submit a plan or submits an inadequate plan, EPA must design and imposes federal standards for the existing sources in that state.[17]

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[9] 42 U.S.C. § 7411(b)(1)(A).

[10] *Id.* § 7411(d)(1); 80 Fed. Reg. at 64,701 (explaining that Section 111(d) applies to "certain existing sources of air pollutants that were not otherwise regulated as criteria pollutants or hazardous air pollutants").

[11] 42 U.S.C. § 7411(d)(1).

[12] *Id.* § 7411(a)(1) (emphasis added).

[13] As discussed below, if a state declines to implement its own standards, or proposes unsatisfactory standards, EPA must impose federal standards. 42 U.S.C. § 7411(d)(2).

[14] 40 C.F.R. § 60.22(b)(5).

[15] *Id.* § 60.23.

[16] *Id.* § 60.24(c).

[17] *Id.* § 60.27(c); *see also* 42 U.S.C. § 7411(d)(2).

III. Constraints on EPA's Section 111(d) Authority

The text of Section 111 contains eight significant constraints on EPA's authority to craft emission guidelines. Most are found in the definition of "standard of performance" in Section 111(a), which reads as follows:

> The term "standard of performance" means a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.[18]

Additional requirements can be found in the text of Section 111(d) itself, which reads, in relevant part:

> The Administrator shall prescribe regulations which shall establish a procedure . . . under which each State shall submit to the Administrator a plan which . . . establishes standards of performance for any existing source . . . . Regulations of the Administrator under this paragraph shall permit the State in applying a standard of performance to any particular source under a plan submitted under this paragraph to take into consideration, among other factors, the remaining useful life of the existing source to which such standard applies.[19]

Breaking these two passages into their component parts reveals the following criteria for any emission guidelines issued by EPA:

1. **EPA must identify the "best system of emission reduction" and calculate the "degree of emission limitation achievable through the application" of that system.** Thus, the agency cannot arbitrarily declare that existing sources in the relevant category must reduce their emissions by a particular amount. Instead, it must survey available *systems* for reducing emissions and calculate the level of reduction achievable using what it considers the *best* of those systems.

2. **In identifying the best system, EPA must consider the amount of emission reductions it will yield.** It goes without saying that a system of emission reduction is unlikely to be "best" if it does a poor job reducing emissions. Thus, when comparing available systems, EPA must consider their relative abilities to decrease the amount of pollution generated by regulated sources.[20]

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[18] 42 U.S.C. § 7411(a).

[19] *Id.* § 7411(d)(1).

[20] *See* Sierra Club v. Costle, 657 F.2d 298, 326 (D.C. Cir. 1981) ("[W]e can think of no sensible interpretation of the statutory words "best . . . system" which would not incorporate the amount of air pollution as a relevant factor to be weighed when determining the optimal standard for controlling . . . emissions.").

3. **In identifying the best system, EPA must consider the system's cost.** A system is not necessarily "best" simply because it can achieve the deepest emission reductions. EPA must also take into account the costs of achieving those reductions and cannot adopt standards that can only be achieved at "excessive," "exorbitant," or "unreasonable" expense.[21] That said, courts have consistently granted EPA "a great degree of discretion" when assessing the reasonableness of a system's costs.[22]

4. **In identifying the best system, EPA must consider "nonair quality health and environmental impacts."** For example, the use of a "scrubber" to remove sulfur dioxide emissions from a power plant's smokestack produces coal ash, which can, if improperly stored, contaminate groundwater.[23] EPA must consider this type of indirect environmental effect—whether positive or negative—when weighing systems of emission reduction. Ultimately, EPA has explained, "a system cannot be 'best' if it does more harm than good due to cross-media environmental impacts."[24]

5. **In identifying the best system, EPA must consider "energy requirements."** This factor could encompass the system's impacts on the regulated sources' *own* energy needs (e.g., because additional power is needed to operate the system identified by EPA), as well as its impacts on the energy needs of a region or the nation as a whole (e.g., because application of the system affects the power sector's output of electricity or the refining sector's output of gasoline).[25] Thus, a system cannot be "best" if it imperils access to reliable energy sources.

6. **EPA must find that its preferred method of emission reduction has been "adequately demonstrated."** Under D.C. Circuit case law, EPA cannot identify a "purely theoretical or experimental means of preventing or controlling air pollution" as the best system of emission reduction.[26] This does not mean, however, that the system must be "in actual routine use somewhere."[27] Instead, the agency can make reasonable projections based on existing technology.[28]

7. **EPA's guidelines must be translatable into "standards of performance" for individual sources.** Ultimately, the standards promulgated by states in response to EPA's guidelines (or by EPA itself in states that decline to develop standards) must be applicable to—and enforceable against—"any existing source" of pollution in the relevant category. The standards, in other words, must take the form of independent compliance obligations for individual sources. The fact that each source is subject to its own standard, however, does not mean that the source must meet its standard solely through actions taken within the walls of its own facility.[29]

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[21] 80 Fed. Reg. at 64,720 (quoting several court decisions on the treatment of costs under Section 111).

[22] Lignite Energy Council v. EPA, 198 F.3d 930, 933 (D.C. Cir. 1999); *see also* 80 Fed. Reg. at 64,720–21 (discussing additional decisions on EPA's discretion to weigh cost against other Section 111 factors).

[23] *See generally* Charles Duhigg, *Cleansing the Air at the Expense of Waterways*, N.Y. Times (Oct. 12, 2009), http://www.nytimes.com/2009/10/13/us/13water.html.

[24] 80 Fed. Reg. at 64,721.

[25] *See id.* (explaining that "EPA may consider energy requirements on both a source-specific basis and a sector-wide, region-wide, or nationwide basis").

[26] Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 391 (D.C. Cir. 1973) (quoting H. Rep. No. 91-1146, 91st Cong., 2d Sess. 10 (1970)).

[27] *Id.* (quoting S. Rep. No. 9-1196, 91st Cong., 2d Sess. 16 (1970)).

[28] *Id.*; *see also* 80 Fed. Reg. at 64,720 (discussing other cases that address the "adequately demonstrated" factor).

[29] 80 Fed. Reg. at 64,779 (explaining that Section 111(d)(1) and (a)(1) "require by their terms that 'any existing source' must have a 'standard of performance,' but nothing in these provisions requires a particular amount—or, for that matter, any amount—of emission reductions from each and every existing source").

8. **EPA's guidelines must give states flexibility to account for the "remaining useful life" of their existing sources.** The application of certain systems of emission reduction might make less economic sense for facilities on the verge of retirement. In particular, requiring sources that are nearing the end of their useful lives to install pollution-control equipment might be needlessly costly.[30] EPA's emission guidelines must allow states some means of taking variations in sources' remaining useful lives into consideration when setting standards.

IV. The Clean Power Plan's Observance of Section 111(d)'s Constraints

In issuing the Clean Power Plan, EPA acknowledged and abided by each of the constraints discussed above.

1. **EPA identified a "best system of emission reduction" and calculated the "degree of emission reduction achievable" using that system.**

According to the Clean Power Plan, the "best system of emission reduction" for CO_2 emissions from existing power plants is the combination of emission rate improvements and limitations on overall emissions that affected plants can accomplish through the following three pollution control measures, or "building blocks":

1. Improving heat rate at coal-fired steam plants;
2. Substituting generation from lower-emitting existing natural gas combined cycle plants ("gas plants") for generation from higher-emitting steam plants, which are primarily coal-fired; and
3. Substituting generation from new zero-emitting renewable generating capacity for generation from fossil fuel-fired plants, which are primarily coal- and gas-fired.[31]

EPA determined that these reduction techniques are available to all power plants affected by the Clean Power Plan, "either through direct investment or operational shifts or through emissions trading."[32]

EPA chose these building blocks after surveying "the types of strategies that states and owner and operators of [power plants] are already employing" to reduce CO_2 from the electric sector, including both technological solutions and "the full range of

Requirements for Section 111(d) Emission Guidelines

- ☑ Best system of emission reduction?
- ☑ Magnitude of reductions?
- ☑ Reasonable cost?
- ☑ Nonair effects?
- ☑ Impacts on energy requirements?
- ☑ Adequately demonstrated?
- ☑ Translatable into standards of performance for sources?
- ☑ Flexibility to consider remaining useful life?

[30] *Id.* at 64,872; *see also* EPA, Legal Memorandum Accompanying Clean Power Plan for Certain Issues 30-36 (2015) (discussing legislative and regulatory history of the "remaining useful life" provision in section 111(d)).
[31] 80 Fed. Reg. at 64,667.
[32] *Id.*

operational practices, limitations, constraints and opportunities that bear upon [power plants'] emission performance."[33] In identifying the "best" of the available strategies, EPA considered not only the statutory factors discussed below—like cost and energy requirements—but also the global nature of CO_2 pollution (which renders the location of emissions unimportant) and the interconnected nature of the electric grid (which allows one plant to substitute generation for another).[34]

EPA then used its building blocks to calculate nationally uniform emission performance rates—expressed in pounds of CO_2 per megawatt hour—for two categories of plant: steam plants and gas plants.[35] The agency also calculated state-specific performance rates based on each state's mix of the two plant types.[36] Finally, EPA translated each state's rate-based target into an alternative mass-based target (i.e., an annual limit on *aggregate* emissions from regulated sources rather than a limit on their average *rate* of emissions).[37]

States have broad flexibility in designing plans to comply with these guidelines and are not required to implement the "best system" as determined by EPA. They simply must ensure that regulated plants "individually, in aggregate, or in combination with other measures taken by the state" achieve the equivalent of the performance rates calculated by EPA.[38]

2. EPA took into account the magnitude of expected emission reductions.

In choosing among available systems of emission reduction, EPA explicitly took into account the volume of emission reduction that each option could be expected to achieve.[39] The agency noted that, outside of its chosen building blocks, it had found no "other measures available under section 111 that are less costly and would achieve emission reductions that are commensurate with the scope of the problem [of global climate change] and [power plants'] contribution to it."[40]

3. EPA took into account costs.

EPA determined the stringency of each building block (e.g., the percentage by which it assumed coal-fired steam plants could improve their heat rate) "based on what is achievable at reasonable cost rather than the maximum achievable amount."[41] It projected that emission reductions could be achieved under building block 1 at an average cost of $23 per ton, under building block 2 at $24 per ton, and under building block 3 at $37 per ton.[42] The agency further estimated that, implemented together, the three building blocks would achieve CO_2 reductions at an average cost of $30 per ton.[43]

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[33] *Id.*
[34] *Id.* at 64,717.
[35] *Id.* at 64,667. EPA first applied the blocks at a regional level and then set the national rates based on the region where the blocks yielded the least stringent result. *Id.* at 64,744 & n.418.
[36] *Id.* at 64,667.
[37] *Id.*
[38] *Id.*
[39] *Id.* at 64,745 (describing, for building block 1, EPA's analysis of the "technical feasibility, costs, and *magnitude of CO_2 emission reductions* achievable through heat rate improvements at coal-fired steam EGUs" (emphasis added)); *id.* at 64,746 (same for building block 2); *id.* at 64,747 (same for building block 3).
[40] *Id.* at 64,751.
[41] *Id.* at 64,748.
[42] *Id.* at 64,749.
[43] *Id.*

EPA assessed the reasonableness of these costs in four ways:

- It compared the building blocks' costs to the costs of controls that power plants had implemented to reduce other air pollutants, such as sulfur dioxide and nitrogen oxides.[44]

- It compared the building blocks' costs to assumptions about the cost of future CO_2 regulations that utilities had used for planning purposes in their Integrated Resource Plans.[45]

- It compared the building blocks' costs to the costs of other means of achieving substantial cuts in power plants' carbon emissions, such as retrofitting plants with carbon capture and storage technology or implementing natural gas co-firing at steam plants.[46]

- It observed that building blocks' costs, both individually and combined, were well below the central estimate of the Social Cost of Carbon, which estimates the monetary value of an avoided ton of carbon emissions in a given year.[47]

Ultimately, EPA concluded that the costs of its "best system of emission reduction" were reasonable when assessed against any of these benchmarks.[48]

4. EPA took into account nonair quality health and environmental impacts.

EPA saw "no reason to expect an adverse non-air environmental . . . impact from deployment of the combination of the three building blocks."[49] Instead, the agency projected that implementation of the building blocks would result in *beneficial* cross-media impacts, in the form of reduced water usage and solid waste production.[50]

5. EPA took into account energy requirements.

EPA took the nation's energy requirements into account by designing guidelines that could be satisfied "without reducing overall electricity generation."[51] To ensure that the Clean Power Plan "reflect[ed] the paramount importance of ensuring electric system reliability,"[52] the agency engaged in "extensive consultation" with the Federal Energy Regulatory Commission, the Department of Energy, and other relevant authorities,[53] and also prepared a detailed technical support document describing the "resource adequacy and reliability impacts" of the rule.[54] Finally, EPA included in the Clean Power Plan a "reliability safety valve" that allows individual sources to temporarily violate emission standards set for

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[44] *Id.* at 64,750.
[45] *Id.*
[46] *Id.* at 64,751.
[47] *Id.*
[48] *Id.* at 64,750-51.
[49] *Id.* at 64,751.
[50] *Id.*
[51] *Id.* at 64,778.
[52] *Id.* at 64,671.
[53] *Id.*
[54] EPA, Technical Support Document: Resource Adequacy and Reliability Analysis (2015), https://www.epa.gov/sites/production/files/2015-11/documents/tsd-cpp-adequacy-reliability.pdf.

them under states' plans where complying with the standards would conflict with "the maintenance of electric system reliability in the face of an extraordinary and unanticipated event that presents substantial reliability concerns."[55]

6. EPA found that its "best system" was adequately demonstrated.

For building block 1, EPA found that "taking action to improve heat rates is a common and well-established practice within the [electric utility] industry."[56]

For building block 2, EPA noted that "the utility power sector has recognized that generation shifts are a means of controlling air pollutants" since the Clean Air Act was passed in 1970.[57] Furthermore, "[s]ince at least 2000, fossil fuel-fired generation has been shifting from coal- and oil-fired [plants] to [gas plants], both as a result of construction of additional [gas plants], and also as a result of dispatch of pre-existing [gas plants] at higher capacity factors."[58] This led to an 83% increase in gas generation between 2005 and 2012, a *higher* growth rate than EPA expects to occur under the Clean Power Plan between 2015 and 2022.[59] In addition to discussing industry trends, EPA noted that past Clean Air Act programs have relied on generation shifting as a means of emission reduction.[60]

Finally, for building block 3, EPA noted that renewable generation "has been relied on since the 1970s to provide energy security by replacing some fossil fuel-fired generation."[61] As with gas-fired generation, the agency found that recent industry trends have led to "rapid growth" in renewable generation that is "projected to continue as costs of [renewable] generation fall relative to the costs of other generation technologies."[62] Finally, EPA noted that "[b]oth Congress and the EPA have previously established frameworks under which [renewable] generation could be used as a means of achieving emission reductions from the utility power sector."[63]

7. EPA ensured that its guidelines are translatable into standards of performance that can be applied to "any existing source."

The Clean Power Plan presents states with a variety of options for imposing standards of performance on individual existing sources. Most obviously, "states may establish emission standards for their affected [plants] that mirror the uniform emission performance rates for the two subcategories of sources" identified by EPA.[64] But a state may also "pursue alternative approaches that adopt emission standards that . . . meet either the [blended] rate-based goal promulgated for the state or the alternative mass-based goal promulgated for the state."[65] For example, the standard of performance in a state adopting a mass-based trading program could simply be that each source must obtain an allowance for each ton of

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[55] 80 Fed. Reg. at 64,671.
[56] *Id.* at 64,745.
[57] *Id.* at 64,746.
[58] *Id.* at 64,795.
[59] *Id.* at 64,800.
[60] *Id.* at 64,746 (noting that generation shifts "have been recognized as a means of reducing emissions under trading programs established by the EPA to implement the [Clean Air] Act's provisions"). Prior EPA programs that relied on generation shifting are discussed in Richard L. Revesz, Denise A. Grab & Jack Lienke, *Familiar Territory: A Survey of Legal Precedents for the Clean Power Plan*, 46 Envtl. L. Rep. 10190, 10193 (2016).
[61] 80 Fed. Reg. at 64,747.
[62] *Id.*
[63] *Id.*
[64] *Id.* at 64,667.
[65] *Id.* at 64,667-68.

carbon it emits over the course of a year. So long as the total pool of allowances available in the state was equal to the mass-based goal set by EPA, this would satisfy the guidelines.[66]

8. EPA gave states sufficient flexibility to account for their sources' remaining useful lives.

EPA found that states have ample discretion to account for their sources' remaining useful lives, because the emission guidelines "do[] not specify presumptive performance rates" that any particular generator must "achieve in the absence of trading."[67] Instead its guidelines "provide collective performance rates for two classes of [generating units] and give states the alternative of developing plans to achieve a state emission goal for the collective group of all affected [units] in a state."[68] By buying emission allowances (in a mass-based trading system) or emission rate credits (in a rate-based trading system), a source approaching the end of its useful life could "avoid excessive up-front capital expenditures that might be unreasonable for a facility with a short remaining useful life."[69] In addition or as an alternative to allowing sources the flexibility of trading, a state could specifically design laxer standards for older sources, so long as it ensured that its overall emission reductions would be consistent with EPA's guidelines.[70]

V. Conclusion

The Clean Power Plan rigorously observes the many constraints on EPA's discretion to craft emission guidelines under Section 111(d). It is not the reckless power grab that opponents describe, but a straightforward application of EPA's longstanding Clean Air Act authority to regulate dangerous emissions from stationary sources of pollution.

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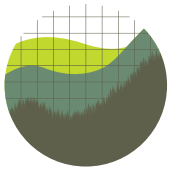
[66] In litigation over the Clean Power Plan, opponents have argued that standards of performance cannot involve individual sources curtailing generation because that would be a standard of "non-performance." Opening Br. of Pet'rs on Core Legal Issues 51, West Virginia v. EPA, No. 15-1363, Doc. No. 1610010 (D.C. Cir. Apr. 22, 2016). However, as EPA has pointed out, "the word 'performance' [in Section 111] refers to *emissions* performance, not *production* performance." Respondent EPA's Final Br. 65, West Virginia v. EPA, No. 15-1363, Doc. No. 1609995 (D.C. Cir. Apr. 22, 2016).

[67] *Id.* at 64,870.

[68] *Id.*

[69] *Id.* at 64,871.

[70] *Id.*



Institute *for*
Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

Institute for Policy Integrity
New York University School of Law
Wilf Hall, 139 MacDougal Street, New York, New York 10012
policyintegrity.org

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Familiar Territory: A Survey of Legal Precedents for the Clean Power Plan

Richard L. Revesz, Denise A. Grab, and Jack Lienke

Richard Revesz is Dean Emeritus and Lawrence King Professor of Law at New York University School of Law, and Director of the Institute for Policy Integrity. Denise Grab and Jack Lienke are Senior Attorneys at the Institute for Policy Integrity.

A coalition of states, utilities, energy producers, and other industry groups has brought a challenge[1] in the U.S. Court of Appeals for the District of Columbia (D.C.) Circuit against the U.S. Environmental Protection Agency's (EPA's) Clean Power Plan (CPP), which limits carbon dioxide (CO_2) emissions from the nation's existing power plants pursuant to §111(d) of the Clean Air Act (CAA).[2] (A competing cohort of states, municipalities, companies, and environmental organizations has intervened in support of the rule.) As of this writing, merits briefing has yet to begin, but the petitioners offered a preview of their arguments in a set of motions to stay the CPP pending resolution of their suit.[3] In support of the stay requests, the petitioners filed dozens of declarations from state government officials and industry representatives, many of which made exaggerated claims regarding the "unprecedented" nature of the CPP. In this Comment, we highlight a wide variety of regulations from the CAA's 45-year history that provide substantial precedent for the flexible design of the CPP.

I. Precedents for the CPP's Inclusion of Beyond-the-Fenceline Pollution Reduction Measures

In order to calculate emission guidelines for existing sources of pollution under §111(d), EPA must first identify the "best system of emission reduction which . . . has been adequately demonstrated" (BSER) for the relevant pollutant and source category.[4] For CO_2 emissions from existing power plants, EPA has determined that the BSER includes a combination of three building blocks: (1) improving the heat rate—that is, the efficiency with which fuel is converted to electricity—of coal-fired steam plants; (2) substituting increased generation from lower-emitting existing natural gas-fired "combined cycle" plants for generation from higher-emitting existing steam plants (which are mostly coal-fired); and (3) substituting increased generation from zero-emitting new renewable capacity—such as wind and solar facilities—for generation from both existing coal-fired plants *and* existing gas-fired plants.[5]

Several declarations filed by opponents of the CPP assert that the rule's reliance on "beyond-the-fenceline" measures for reducing pollution (building blocks 2 and 3), as opposed to just technological or operational requirements imposed on individual sources (building block 1), has no precedent under CAA §111. For example, one New Jersey official claims that the "requirement that [New Jersey] regulate 'outside the fence' of affected [electric generating units] is an unprecedented regulatory approach under Section 111 of the Clean Air Act."[6] Similarly, the president of an energy institute affiliated with the U.S. Chamber of Commerce insists that "EPA has never asserted the authority under Clean Air Act [§]111 to set standards that look beyond the boundaries of individual regulated facilities to mandate systemic changes."[7]

Other declarants suggest that beyond-the-fenceline regulation is unprecedented not just under §111, but under the CAA as a whole. A Wyoming official, for example, claims that the CPP's "'outside the fence' control measures . . . are unlike any other Clean Air Act requirements [the state's Department of Environmental Quality] implements."[8] Likewise, a West Virginia declarant asserts

Note: The authors will be filing an amicus brief in support of the U.S. Environmental Protection Agency in West Virginia v. EPA, *No. 15-1363 (D.C. Cir.).*

1. West Virginia v. EPA, No. 15-1363 (D.C. Cir. Oct. 23, 2015).
2. 42 U.S.C. §§7401-7671q, ELR STAT. CAA §§101-618.
3. After the U.S. Court of Appeals for the D.C. Circuit denied motions to stay, Order, West Virginia v. EPA, No. 15-1363, Doc. No. 1594951 (D.C. Cir. Jan. 21, 2016), petitioners successfully sought a stay from the U.S. Supreme Court. Order, West Virginia v. EPA, Doc. No. 15A773 (U.S. Feb. 9, 2016).
4. Carbon Pollution Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64662, 64707 (Oct. 23, 2015); *see also* 42 U.S.C. §7411(a)(1), (d).
5. 80 Fed. Reg. at 64707.
6. State Petitioners' Motion for Stay and for Expedited Consideration of Petition for Review, Addendum pt. II, ex. C, Declaration of Bob Martin, at C000134 ¶ 8, West Virginia v. EPA, No. 15-1363, Doc. No. 1579999 (D.C. Cir. Oct. 23, 2015) [hereinafter State Petitioners' Motion to Stay].
7. Chamber of Commerce et al., Motion for Stay of EPA's Final Rule, ex. 7-A, Declaration of Karen Alderman, ¶ 10, West Virginia v. EPA, No. 15-1363, Doc. No. 1580020 (D.C. Cir. Oct. 23, 2015).
8. State Petitioners' Motion to Stay, Addendum pt. II, ex. C, Declaration of Todd Parfitt, at C000173, ¶ 7.

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that the CPP's "reliance on measures outside the affected facilities' boundaries (fence-line) . . . are entirely unprecedented for any state."[9]

The declarants' claims echo an earlier, somewhat narrower argument made by other opponents of the CAA, who acknowledge that EPA has previously allowed beyond-the-fenceline reduction techniques as a means of *complying* with emission limits, but maintain that the availability of such techniques has never before been taken into account when determining the *stringency* of those limits.[10]

In fact, EPA previously promulgated several rules—under both §111 and other provisions of the CAA—that incorporate beyond-the-fenceline strategies for reducing emissions. In a number of these rulemakings, beyond-the-fenceline reduction techniques were used not only as a compliance mechanism, but also to determine the stringency of the relevant emission limits, sometimes justifying more stringent restrictions than would otherwise have been imposed.

Regulations for which stringency was informed by beyond-the-fenceline reduction techniques include the Clean Air Mercury Rule, issued under §111; emission guidelines for municipal waste combustors and medical waste incinerators, issued jointly under §111 and §129; the Cross-State Air Pollution Rule and its predecessors, issued pursuant to the Good Neighbor Provision of §110; the regional haze trading program, approved under §169A; lead standards for gasoline, issued under §211; and emission standards for motor vehicles, issued under §202. We discuss each of these precedents in more detail below.

A. Beyond-the-Fenceline Rulemaking Under §111

1. Clean Air Mercury Rule

Under the George W. Bush Administration in 2005, EPA issued the Clean Air Mercury Rule (CAMR), which set statewide targets for mercury emissions from power plants and allowed for intersource and interstate trading of emission allowances.[11] By its very nature, an emission trading scheme reaches beyond the fencelines of individual plants, allowing a group of regulated sources to apportion a collective reduction burden among themselves based on their relative costs of abatement. Notably, emission trading was not merely a permissible means of complying with CAMR, but was also identified by EPA as a component of the "best system of emission reduction" for mercury from power plants.[12] In other words, EPA took the availability of trading into account when determining the appropriate stringency of the rule's emission budgets.

In proposing and enacting CAMR, EPA explained why emission trading is justified under §111(d). Among other things, the Agency noted that "the term 'standard of performance' is not explicitly defined [in §111] to include or exclude an emissions cap and allowance trading program."[13] "Nor," EPA pointed out, "do any other provisions of [§]111(d) indicate that the term 'standard of performance' may not be defined to include a cap-and-trade program."[14] Accordingly, EPA amended the §111 implementing regulations to provide that a state's "[e]mission standards shall either be based on an allowance system or prescribe allowable rates of emissions except when it is clearly impracticable."[15]

Though CAMR was ultimately vacated by the D.C. Circuit, the reversal was on grounds unrelated to trading or the stringency of the rule's emission budgets, and the language regarding allowance systems in §111's implementing regulations remains in place.[16]

2. Emission Guidelines for Large Municipal Waste Combustors

CAMR was not the first §111(d) rule to look beyond the fencelines of individual sources. Under the Clinton Administration in 1995, EPA incorporated beyond-the-fenceline reduction strategies into its emission guidelines for large municipal waste combustors, issued jointly under §§111(d) and 129.[17] The guidelines allowed regulated entities both to average the nitrogen oxides (NO_x) emission rates of multiple units within a single large plant and to trade emission credits with other plants.[18] Further, plants that chose to take advantage of emission averaging were subject to tighter emission guidelines than those that did not.[19] Thus, as in CAMR, the availability of beyond-the-fenceline reduction techniques affected the stringency of the municipal waste combustors rule.

9. *Id.* at Addendum pt. II, ex. C, Declaration of William F. Durham, at C000014 ¶ 2.
10. *See, e.g.*, *EPA's CO_2 Regulations for New and Existing Power Plants, Legal Perspectives: Hearing Before the Subcomm. on Energy & Power of the H. Comm. on Energy & Commerce*, 114th Cong. 19-20 (Oct. 22, 2015) (statement of Allison Wood, Partner, Hunton & Williams LLP), *available at* http://docs.house.gov/meetings/IF/IF03/20151022/104065/HHRG-114-IF03-Wstate-WoodA-20151022.pdf.
11. Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam Generating Units, 70 Fed. Reg. 28606, 28606 (May 18, 2005).
12. *Id.* at 28617 ("EPA has determined that a cap-and-trade program based on control technology available in the relevant timeframe is the best system for reducing [mercury] emissions from existing coal-fired Utility Units.").
13. *Id.* at 28616.
14. *Id.* at 28617.
15. *Id.* at 28649.
16. New Jersey v. EPA, 517 F.3d 574, 577-78, 38 ELR 20046 (D.C. Cir. 2008); 40 C.F.R. §60.24(b)(1).
17. Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources; Municipal Waste Combustors, 60 Fed. Reg. 65387 (Dec. 19, 1995).
18. *Id.* at 65402.
19. *Id.*

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3. Emission Guidelines for Medical Waste Incinerators

In 1997, also under the Clinton Administration, EPA issued another set of joint §§111(d) and 129 emission guidelines aimed at medical waste incinerators.[20] These guidelines also looked beyond the fencelines of individual sources, requiring owners of regulated incinerators to develop waste management programs that could include "paper, cardboard, plastics, glass, battery, or metal recycling," and were designed to "reduce the volume of waste to be incinerated, and thereby reduce the amount of air pollution emissions associated with that waste."[21] Implementing such programs necessarily involved actions outside the walls of individual incinerators. As in the previous examples, then, the medical waste incinerator rule's stringency was affected by beyond-the-fenceline reduction techniques.

B. Beyond the Fenceline Rulemaking Under Other CAA Sections

EPA has also employed beyond-the-fenceline reduction techniques in regulations issued under CAA provisions *other* than §111, even where those provisions do not expressly authorize such an approach. As with the §111 precedents, in these rulemakings, EPA not only allowed beyond-the-fenceline reduction techniques as a compliance mechanism, but also took such techniques into account when determining the stringency of emission limits.

1. Trading Under the Good Neighbor Provision

EPA incorporated emission trading into a series of rules issued under §110(a)(2)(D), commonly known as the Good Neighbor Provision, which prohibits "sources" in upwind states from emitting pollution in amounts that "significantly contribute" to a downwind state's failure to attain or maintain the national ambient air quality standards.[22] In the 1998 NO_x SIP Call, promulgated during the Clinton Administration[23]; the 2005 Clean Air Interstate Rule, promulgated during the George W. Bush Administration[24]; and the 2011 Cross-State Air Pollution Rule (CSAPR), promulgated during the Obama Administration,[25] EPA established statewide emission budgets for the power sector and crafted trading mechanisms that states could opt into as a flexible, cost-effective means of meeting their budgets. EPA's previous actions under §110(a)(2)(D) are especially instructive because §111(d) directs the EPA Administrator to follow "a procedure similar to that provided by section [110]" when working with states to set standards of performance for existing sources.[26]

In setting state budgets for CSAPR, EPA explicitly took into account emission reductions that could be achieved *only* by going outside the fenceline of an individual plant, such as those associated with "increased dispatch of lower-emitting generation."[27] Thus, CSAPR's stringency was directly linked to the availability of beyond-the-fenceline reduction techniques. The U.S. Supreme Court upheld CSAPR in 2014, ruling that "EPA's cost-effective allocation of emission reductions among upwind States . . . [was] a permissible, workable, and equitable interpretation of the Good Neighbor Provision."[28]

2. Regional Haze Trading Program

EPA also used emission trading to address regional haze under CAA §169A.[29] Under the Obama Administration in 2012, the Agency approved a regional trading program proposed by a group of western states and municipalities to address their collective contributions to haze in the Colorado Plateau.[30] In approving the trading program, EPA found that it would achieve *greater* overall reductions than the installation of "Best Available Retrofit Technology" at individual sources.[31] In other words, as in previous examples, the incorporation of beyond-the-fenceline techniques enabled a more stringent reduction target. The U.S. Court of Appeals for the Tenth Circuit upheld the regional haze trading program in 2014.[32]

3. Trading and Averaging Under Mobile Source Provisions

EPA has also, for decades, taken a beyond-the-source approach to its regulation of mobile sources of pollution under Title II of the CAA. For example, under the Reagan Administration in 1982, EPA promulgated a §211 standard

20. Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Hospital/Medical/Infectious Waste Incinerators, 62 Fed. Reg. 48348, 48348 (Sept. 15, 1997).
21. *Id.* at 48348, 48359. The waste management plans under this rule were not challenged and remained in place despite a remand of the rule following a suit that challenged other parts of the regulation. *See* 72 Fed. Reg. 5510 (Feb. 6, 2007).
22. 42 U.S.C. §7410(a)(2)(D)(i)(I).
23. Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone, 63 Fed. Reg. 57356, 57358, 57456 (Oct. 27, 1998).
24. Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule); Revisions to Acid Rain Program; Revisions to the NO_x SIP Call, 70 Fed. Reg. 25162, 25162, 25229 (May 12, 2005).
25. Federal Implementation Plans: Interstate Transport of Fine Particulate Matter and Ozone and Correction of SIP Approvals, 76 Fed. Reg. 48208, 48210 (Aug. 8, 2011).
26. 42 U.S.C. §7411(d)(1).
27. 76 Fed. Reg. 48252.
28. EPA v. EME Homer City Generation, LP, 134 S. Ct. 1584, 161044 ELR 20094 (2014).
29. 42 U.S.C. §7491.
30. Final Rule, Approval and Promulgation of State Implementation Plans; Wyoming, 77 Fed. Reg. 73926, 73927 (Dec. 12, 2012); Final Rule, Approval, Disapproval and Promulgation of State Implementation Plans; Utah, 77 Fed. Reg. 74355, 74357 (Dec. 14, 2012); Final Rule, Approval and Promulgation of State Implementation Plans; New Mexico, 77 Fed. Reg. 70693, 70695 (Nov. 27, 2012); Final Rule, Approval and Promulgation of State Implementation Plans; City of Albuquerque-Bernalillo County, 77 Fed. Reg. 71119, 71121 (Nov. 29, 2012).
31. *Id.*
32. WildEarth Guardians v. EPA, 770 F.3d 919, 923, 44 ELR 20229 (10th Cir. 2014).

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for the lead content of gasoline that some refineries could satisfy only by obtaining blending components or "lead credits" from other refineries.[33] This aggregate approach to lead reduction was upheld by the D.C. Circuit.[34]

EPA has taken a similarly flexible approach to emission standards for motor vehicles under CAA §202.[35] Rather than requiring each new vehicle to achieve the same degree of emission control, EPA has set standards that a manufacturer's fleet can meet on average.[36] In some cases, a manufacturer's "over-compliance" with its fleetwide standard generates credits that can be traded with other manufacturers.[37] The D.C. Circuit upheld this fleetwide approach to §202 in 1986, finding that, in the absence of "any clear congressional prohibition of averaging," EPA's effort to "allow manufacturers more flexibility in cost allocation while ensuring that a manufacturer's overall fleet still meets the emissions reduction standards makes sense."[38]

II. Precedents for the CPP's Shifting of Generation From One Energy Source to Another

In addition to asserting that the use of beyond-the-fenceline strategies is unprecedented under the CAA, some declarants claim that the CPP is the first CAA regulation to shift generation from relatively dirtier sources of energy to relatively cleaner sources. For example, an Ohio official states that the CPP's "reliance on the reduction of demand from a particular source of energy . . . is entirely unprecedented."[39] This statement is echoed almost verbatim by at least three other declarants.[40] In reality, substantial precedent exists for programs under the CAA that influence the type of fuel used for the production of electricity. Indeed, implementation of the CAA has repeatedly, over more than four decades, resulted in fundamental shifts in the fuel balance used in the power sector throughout the United States. We provide a representative (not comprehensive) set of examples below.

A. Programs That Shifted Demand to Low-Sulfur Coal

Some programs have shifted demand from high- to low-sulfur coal. For example, EPA's first-ever sulfur dioxide performance standard for new power plants, promulgated under the Nixon Administration in 1971, was set at a level that could be satisfied either by installing scrubbers on plants using high-sulfur eastern coal *or* by burning low-sulfur western coal.[41] EPA expected the standard to encourage plants in some states to shift from high-sulfur coal to low-sulfur coal.[42]

The Title IV acid rain trading program, established as part of the CAA Amendments of 1990, further encouraged the substitution of low-sulfur coal for high-sulfur coal. More than one-half of the plants regulated during the first phase of that program complied by increasing their use of low-sulfur coal rather than employing scrubbers.[43]

B. Programs That Shifted Demand to Natural Gas

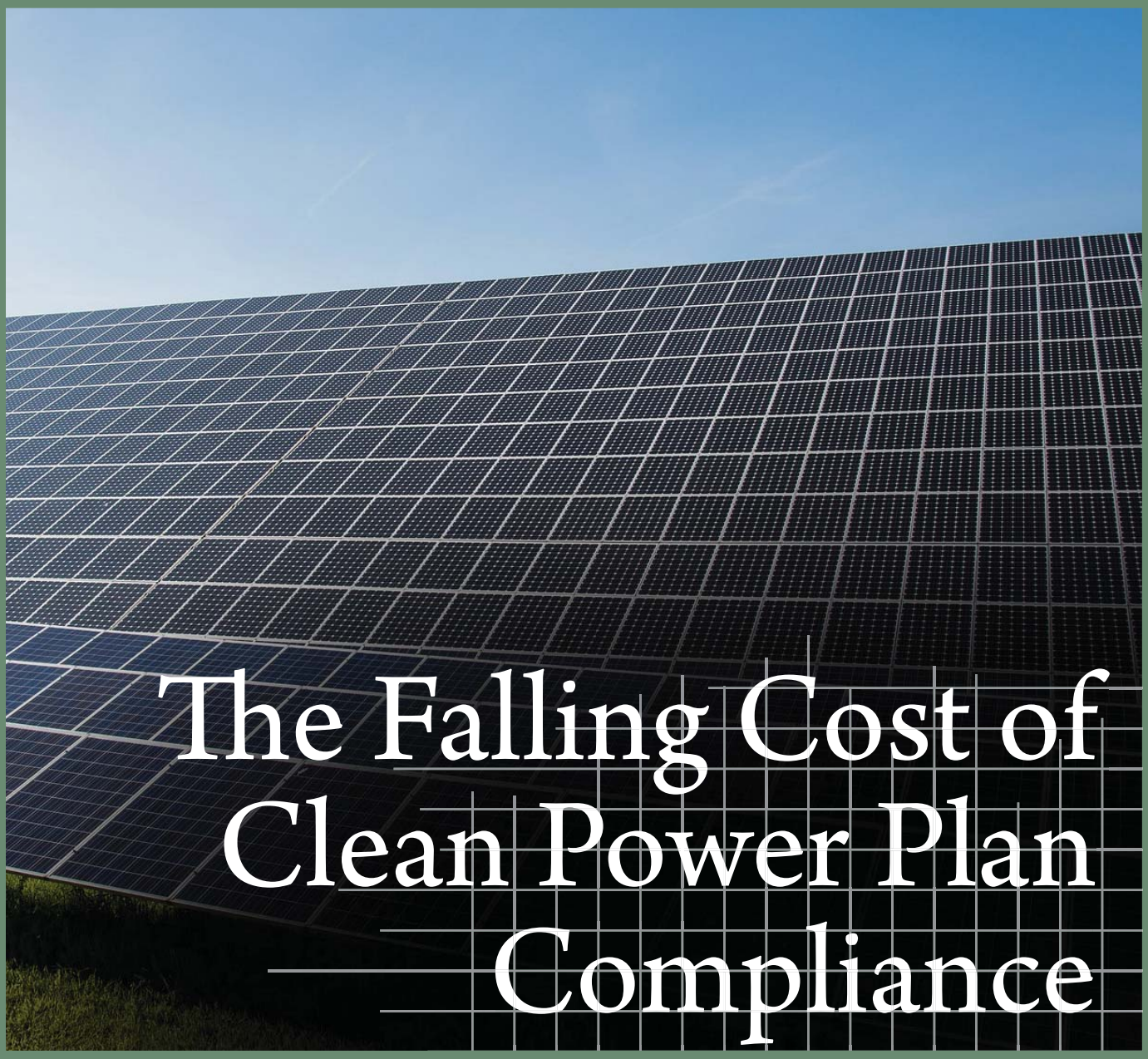
Other EPA regulations have, like the CPP, encouraged a shift from coal to natural gas. In 2011, for example, EPA predicted that its Mercury and Air Toxics Standards (MATS) would result in a 1.3% decrease in coal generation and a 3.1% increase in natural gas generation between 2009 and 2015.[44]

Also in 2011, EPA estimated that CSAPR would result in a 1.9% decrease in coal generation and a 4.1% increase in natural gas generation between 2009 and 2014.[45]

III. Conclusion

As the above examples demonstrate, there is ample precedent under the CAA both for the issuance of regulations that rely on beyond-the-fenceline pollution reduction techniques, such as emission trading, and for the issuance of regulations that influence the type of fuel used in the production of electricity.

33. Small Refiner Lead Phase-Down Task Force v. EPA, 705 F.2d 506, 534-35, 13 ELR 20391 (D.C. Cir. 1983).
34. *Id.* at 536.
35. 42 U.S.C. §7521(a)(1).
36. *See, e.g.*, 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62624, 62627-28 (Oct. 15, 2012).
37. *Id.* at 62628.
38. Natural Res. Def. Council v. Thomas, 805 F.2d 410, 425, 17 ELR 20269 (D.C. Cir. 1986).
39. State Petitioners' Motion to Stay, Addendum pt. II, ex. C, Declaration of Robert Hodanbosi, at C000052 ¶ 2.
40. *Id.* at Addendum pt. II, ex. C, Declaration of Brian Gustafson, at C000040 ¶ 6; *id.* at Addendum pt. II, ex. C, Declaration of Jim Macy, at C000129 ¶ 3; *id.* at Addendum pt. II, ex. C, Declaration of Stuart Spencer, at C000188 ¶ 2.
41. *See* Bruce Ackerman & William T. Hassler, Clean Coal/Dirty Air: or How the Clean Air Act Became a Multibillion-Dollar Bail-Out for High-Sulfur Coal Producers 19 (1981). Scrubbers rely on a chemical reaction to remove sulfur from exhaust gases as they pass through a smokestack. Richard L. Revesz & Jack Lienke, Struggling for Air: Power Plants and the "War on Coal" 32 (2016).
42. Ackerman & Hassler, *supra* note 41, at 19 (noting that EPA "recognized that utilities might respond to [its 1971 standard of performance] the natural way, by burning [low-sulfur] coal"); *see also id.* at 34 (describing a 1976 EPA report that predicted a 15% decline in high-sulfur coal production in Illinois, Indiana, and western Kentucky by 1990 under EPA's 1971 standard of performance).
43. *See* Richard Schmalensee & Robert N. Stavins, *The SO_2 Allowance Trading System: The Ironic History of a Grand Policy Experiment*, 27 J. Econ. Persp. 103, 111 (2013) (noting that 59% of the sulfur dioxide reductions achieved during the first phase of the Acid Rain Trading Program were a result of fuel switching or blending rather than emission scrubbing).
44. *See* U.S. EPA, Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards 3-16 tbl. 3-6 (2011). In 2015, the Supreme Court remanded MATS to the D.C. Circuit for further review, after finding that the *timing* of EPA's consideration of the rule's costs was improper. Michigan v. EPA, 135 S. Ct. 2699, 2711, 45 ELR 20124 (2015). The Court specifically declined, however, to comment on the *content* of that cost analysis, which included EPA's estimate of the rule's effects on the national generation mix. *Id.*
45. U.S. EPA, Regulatory Impact Analysis for the Federal Implementation Plans to Reduce Interstate Transport of Fine Particulate Matter and Ozone in 27 States; Correction of SIP Approvals for 22 States 261 tbl. 7-13 (2011).



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The Falling Cost of Clean Power Plan Compliance

Institute *for* Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

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Denise A. Grab
Jack Lienke

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Institute for Policy Integrity
New York University School of Law
Wilf Hall, 139 MacDougal Street
New York, New York 10012

Denise A. Grab is the Western Regional Director at the Institute for Policy Integrity at New York University School of Law. Jack Lienke is the Regulatory Policy Director at the Institute for Policy Integrity. The authors wish to thank staff at M.J. Bradley & Associates LLC for assistance in preparing this report.

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Executive Summary

In 2015, the U.S. Environmental Protection Agency (EPA) released the Clean Power Plan (CPP), a Clean Air Act rule designed to address the threat of climate change by cutting carbon dioxide (CO_2) emissions from fossil fuel-fired power plants.[1] The CPP established CO_2 emission targets that phased in gradually, with full compliance not required until 2030, and allowed states substantial discretion in designing plans to meet those goals. EPA projected that the rule would, once fully implemented, reduce the U.S. electric sector's CO_2 pollution to 32 percent below 2005 levels.[2]

The Trump Administration has signaled its intention to suspend, revise, or rescind the Clean Power Plan, as part of a broader review of regulations that "may place unnecessary, costly burdens" on utilities and coal producers.[3] But when EPA issued the CPP, it found that the rule's compliance costs were far outweighed by its climate and health benefits. Specifically, the agency's Regulatory Impact Analysis (RIA) estimated that the CPP would generate between $32 and $54 billion in annual benefits, compared to between $5.1 and $8.4 billion in annual costs.[4] (To put those compliance costs in perspective, note that EPA projected total generating costs for the electric sector of about $180 billion in 2030.[5])

Furthermore, the electric sector has changed since 2015, in ways that make the CPP's emission targets easier to achieve. Key market and policy developments include:

- Ongoing declines in the costs of renewable energy, particularly solar energy;
- The 2015 extension of federal tax credits for renewable energy;
- State programs to support the adoption of clean energy technologies; and
- Further declines in the forecast price of natural gas.

If EPA were to update its RIA with current data that reflected these developments, it would project even lower compliance costs than it did in 2015.

Indeed, more recent economic analyses conducted by independent, non-governmental entities have estimated substantially lower compliance costs than EPA did. A June 2016 analysis by M.J. Bradley & Associates (MJB&A), which used the same electric sector model as EPA but updated several key inputs, provides a particularly clear illustration of the extent to which post-2015 market and policy developments have reduced CPP compliance costs. In January 2016, MJB&A estimated annual CPP compliance costs in 2030 that ranged from $4.5 to $8.2 billion, depending on

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1 Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,662 (Oct. 23, 2015).

2 *Id.* at 64,665.

3 EPA Status Report, West Virginia v. EPA, No. 15-1363 (D.C. Cir. Sept. 7, 2017); Press Release, EPA, EPA to Review the Clean Power Plan Under President Trump's Executive Order (Mar. 28. 2017), https://www.epa.gov/newsreleases/epa-review-clean-power-plan-under-president-trumps-executive-order.

4 *See* EPA, Regulatory Impact Analysis for the Clean Power Plan Final Rule tbl.ES-9 & tbl.ES-10 (2015) (using 3% discount rate) [hereinafter CPP RIA]. EPA estimated costs assuming two different compliance frameworks, reflecting the flexible compliance options the final rule provided to states. The $5.1 billion estimate assumes that all states adopt a mass-based compliance framework. The $8.4 billion estimate assumes that all states adopt a rate-based compliance framework.

5 *Id.* tbl.3-9.

certain assumptions regarding state implementation choices.[6] Five months later, after updating its modeling to reflect the extension of renewable tax credits and falling price forecasts for natural gas, MJB&A projected costs for the same compliance scenarios that were, on average, 65 percent lower than its prior estimates.[7]

The cost-lowering effects of recent market developments were also reflected in an October 2016 analysis by the American Petroleum Institute (API). Using the same computer model as EPA but incorporating updated fuel price assumptions, API estimated that, under one possible compliance scenario, the CPP would impose no costs at all in 2030.[8] Under another compliance scenario, API projected costs that were more than 40 percent lower than EPA's estimate.[9]

This report summarizes the findings of EPA's 2015 RIA, discusses subsequent market and policy developments that have lowered the cost of complying with the CPP, and, finally, surveys more recent CPP cost analyses by independent groups that incorporated some or all of those market and policy developments.

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[6] *See infra* Table 3.

[7] *Id.* (projecting compliance costs ranging from $0.8 to $3.7 billion).

[8] *See infra* Table 4 (projecting compliance costs of $0 for mass-based compliance framework that applies only to existing sources).

[9] *See id.* (projecting compliance costs of $3 billion for mass-based compliance framework that applies to both new and existing sources).

EPA's 2015 Analysis of the Clean Power Plan's Costs and Benefits

When evaluating rules that affect the electric sector, EPA has long relied on the Integrated Planning Model (IPM), a peer-reviewed model developed and maintained by the consulting firm ICF International.[10] Used by a wide variety of private and public-sector entities, IPM integrates key operational elements of electric power generation and assesses the sector's total generating costs given specified constraints, such as limits on air pollution emissions. To estimate a rule's costs, EPA first models what the electric sector's total capital and operational costs would be in a given year without the new regulation in place. The agency then estimates the sector's total costs for the same year with the rule's emission constraints added. The difference between the two estimates represents the incremental cost of compliance.

The CPP provides states and power companies with significant flexibility as to their method of compliance. As a result, in its RIA for the CPP, EPA had to make a number of assumptions about how states would design compliance plans and how power companies would comply. These included assumptions about the use of interstate emissions trading or averaging, whether states would allow affected power plants to bank compliance instruments for later use, and the amount of energy efficiency that states and companies would pursue as an emission-reduction tool. Ultimately, EPA chose to model two illustrative compliance scenarios: a rate-based scenario (in which all states met a standard limiting pounds of CO_2 per megawatt hour of electricity generated) and a mass-based scenario (in which all states capped *total* CO_2 emissions from the electric sector).[11] Under the rate-based scenario, EPA assumed that fossil fuel-fired generating units subject to the CPP could achieve the rule's emission-rate targets by averaging emissions with other units in the same state and by lowering their effective emission rates through the procurement of renewable energy generation and energy-efficiency savings anywhere in their interconnection region.[12] Under the mass-based approach, EPA assumed that units could trade emissions allowances only with other units in the same state.[13] It also assumed that state governments would pursue cost-effective energy efficiency projects to reduce electricity demand and emissions.[14]

As summarized in Table 1, EPA estimated annual incremental compliance costs in 2030 of $8.4 billion for the rate-based approach and $5.1 billion for the mass-based approach.[15] These incremental compliance costs reflect the change in the electric sector's capital and operation costs under the CPP, relative to a business-as-usual scenario without the CPP.[16] Estimated compliance costs also reflect both the expenditures necessary to achieve expected levels of energy efficiency and the offsetting value of the energy savings that flow from those efficiency improvements.[17] In this way, the annual incremental compliance costs reflect the net costs of energy efficiency.

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[10] *See* EPA, Clean Air Markets – Power Sector Modeling, https://www.epa.gov/airmarkets/clean-air-markets-power-sector-modeling (last visited Sept. 28, 2017).
[11] CPP RIA, *supra* note 4, at 3-7.
[12] *Id.* at 3-8 to 3-10.
[13] *Id.* at 3-10.
[14] *Id.* at 3-9 to 3-10.
[15] *Id.* at ES-9.
[16] *Id.* at ES-10.
[17] *Id.*

Table 1: EPA Estimates of Annual Incremental Compliance Costs (billion 2011$)

Compliance Approach	2025	2030
Rate-based	$1.0	$8.4
Mass-based	$3.0	$5.1

In addition to estimating the costs of the CPP, EPA estimated the rule's benefits that could be given a monetary value. These included both the climate benefits of CO_2 emission reductions and the health benefits—such as avoided premature deaths, heart attacks, and asthma hospitalizations—of reductions in sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter (PM2.5) emissions that would result from the CPP.[18] The IPM model projected the quantity of these pollutants that would be reduced under the CPP, which EPA then monetized using established metrics such as the social cost of carbon (SCC).[19] EPA expressed health co-benefits as a range to reflect different estimates in the scientific literature of the relationship between air pollution and health outcomes.[20]

For 2030, EPA estimated combined annual climate benefits and health co-benefits of $32 to $48 billion under the mass-based approach and $34 to $54 billion under the rate-based approach.[21] These benefits reflect the net present value of the emission reductions achieved by the CPP, using a three percent discount rate.[22]

Overall, EPA estimated that, in 2030, the CPP's annual benefits would exceed its annual costs by $26 to $43 billion under a mass-based approach and $26 to $45 billion under a rate-based approach.[23]

Photo © Energy.gov

[18] *Id.* at ES-10 to ES-11.

[19] The SCC is a monetary estimate of the net economic impact of each ton of carbon dioxide that is released into the air. Based on the results of multiple, independent modeling efforts, and developed by an interagency working group with review and input from the National Academy of Sciences, the metric has been used by a variety of agencies to evaluate policies that affect greenhouse gas emissions. For additional background on the SCC, *see* Institute for Policy Integrity, Social Cost of Greenhouse Gases (2017), http://policyintegrity.org/files/media/Social_Cost_of_Greenhouse_Gases_Factsheet.pdf.

[20] CPP RIA, *supra* note 4, tbl.ES-7 (explaining that health co-benefits estimates reflect a "range based on adult mortality functions" from the scientific literature).

[21] *See id.* at tbl.ES-7 & tbl.ES-8.

[22] The RIA also included estimates of climate benefits at discount rates of 2.5% and 5% and estimates of health co-benefits at a discount rate of 7%. *Id.* at tbl.ES-9 & tbl.ES-10. Under all rates, the CPP's benefits outweighed its costs.

[23] *Id.* at tbl.ES-9 & tbl.ES-10.

Figure 1: EPA Estimates of Annual Benefits and Costs in 2030 at a 3% Discount Rate (billion 2011$)[24]

In addition to the monetized climate and health co-benefits summarized above, EPA identified additional benefits that it was not able to quantify or monetize as part of its analysis. These additional benefits included: climate impacts from changes in non-CO_2 greenhouse gases, such as methane and aerosols; climate impacts from changes in black carbon and ozone; health impacts of reductions in exposure to mercury; and ecosystem impacts from improved visibility and reductions in acid rain.[25]

Recent Energy Sector Developments Relevant to the Clean Power Plan

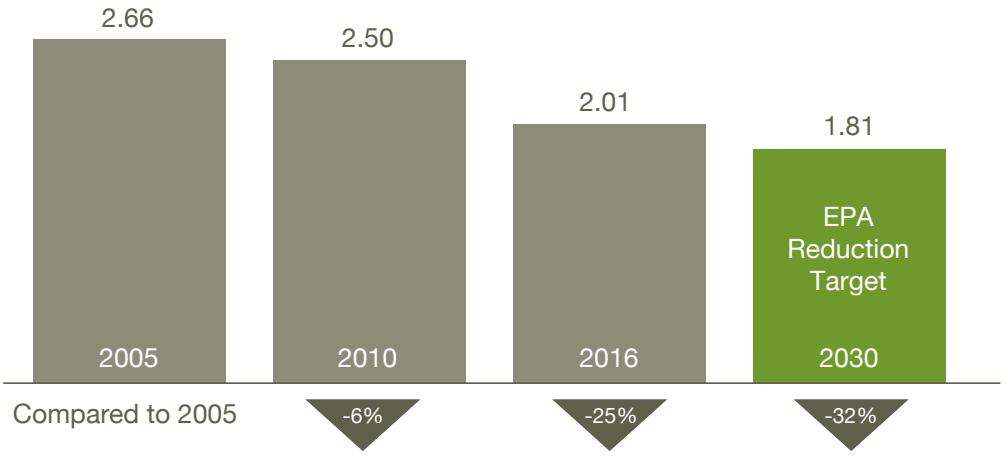
EPA established the CPP's CO_2 emission guidelines based "in large part on already clearly emerging growth in clean energy innovation, development and deployment."[26] These trends continue to reshape the electric power system in the United States, moving the sector closer to the CPP's emission targets, even though implementation of the rule has been suspended since February 2016.[27]

[24] All estimates are rounded to two significant figures, so numbers may not sum.
[25] CPP RIA, *supra* note 4, tbl.ES-6.
[26] 80 Fed. Reg. at 64,662.
[27] The U.S. Supreme Court stayed the rule pending resolution of certain legal challenges. West Virginia v. EPA, 136 S. Ct. 1000 (2016) (mem.).

When it finalized the CPP in 2015, EPA expected the rule to reduce annual electric sector CO_2 emissions to 32 percent below 2005 levels by 2030. Without the rule, EPA expected 2030 emissions to be only 17 percent below 2005 levels.[28]

By 2016, power sector emissions were already down to 25 percent below 2005 levels (see Figure 2),[29] and current modeling suggests that, in the absence of the CPP, emissions in 2030 could be between 22 and 28 percent below 2005 levels, depending on the price of natural gas.[30] Thus, although the CPP is still expected to achieve significant CO_2 reductions beyond those that the market would achieve on its own, the gap between projected emissions with the CPP and projected emissions without the CPP has narrowed since 2015.[31]

Figure 2: Carbon Dioxide from Electric Sector: Historic Emissions and EPA Target (billion short tons)



Note: *The EPA reduction target shown here is calculated as 32% below 2005 electric sector emissions as reported by EIA.*

One of the key factors driving recent emission reductions has been a decline in coal-fired power generation, primarily caused by low natural gas prices.[32] Although this trend was already occurring when EPA developed the CPP, price forecasts for natural gas have continued to decline. In its RIA, EPA used estimates developed by the Department of Energy's Energy Information Administration (EIA) for its Annual Energy Outlook (AEO) in 2015.[33] Since the RIA was published, however, EIA's natural gas price forecast for 2030 has dropped by more than 12 percent.[34]

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[28] CPP RIA, *supra* note 4, tbl.ES-4.

[29] U.S. Energy Info. Admin., Monthly Energy Review June 2017 tbl.12.6 (2017), *available at* https://www.eia.gov/totalenergy/data/monthly/archive/00351706.pdf.

[30] *See* U.S. Energy Info. Admin., Annual Energy Outlook 2017, Energy-Related Carbon Dioxide Emissions by Sector and Source: Reference Case Without Clean Power Plan, https://www.eia.gov/outlooks/aeo/tables_side.php; *id.*, Energy-Related Carbon Dioxide Emissions by Sector and Source: High Resource Without Clean Power Plan, https://www.eia.gov/outlooks/aeo/supplemental_case.php.

[31] Importantly, no matter how small the gap between projected business-as-usual emissions and emissions under the CPP becomes, the CPP provides certainty regarding future reductions that market trends alone cannot.

[32] *See, e.g.*, Trevor Houser et al., Columbia SIPA Center on Global Energy Policy, Can Coal Make a Comeback? (2017) (estimating that "49 percent of the decline in domestic US coal consumption was due to the drop in natural gas prices, 26 percent was due to lower than expected electricity demand, and 18 percent was due to growth in renewable energy").

[33] CPP RIA, *supra* note 4, at 3-5.

[34] Compare U.S. Energy Info. Admin., Annual Energy Outlook 2015 tbl.A1 (2015), https://www.eia.gov/outlooks/archive/aeo15/pdf/tbla1.pdf (projecting a natural gas price of $5.69 per MMBtu in 2030 under reference case), *with* U.S. Energy Info. Admin., Annual Energy Outlook 2017, tbl.A1 (projecting a price of $5.00 per MMBtu in 2030 under reference case).

Coinciding with the start of the shale gas revolution, coal generation peaked in 2007, at which time it was responsible for 50 percent of total generation in the United States.[35] By 2014, the year before EPA completed its modeling, coal's share of generation had declined to 40 percent.[36] And in 2016, coal generation dropped to 31 percent of the nation's total.[37] That same year, natural gas overtook coal as the nation's largest source of electricity for the first time since EIA began collecting data (see Figure 3).[38] Coal-fired power plants have continued to retire from the system in 2017.[39]

Figure 3: Historic Generation Trends of Select Fuel Types (terawatt hours)

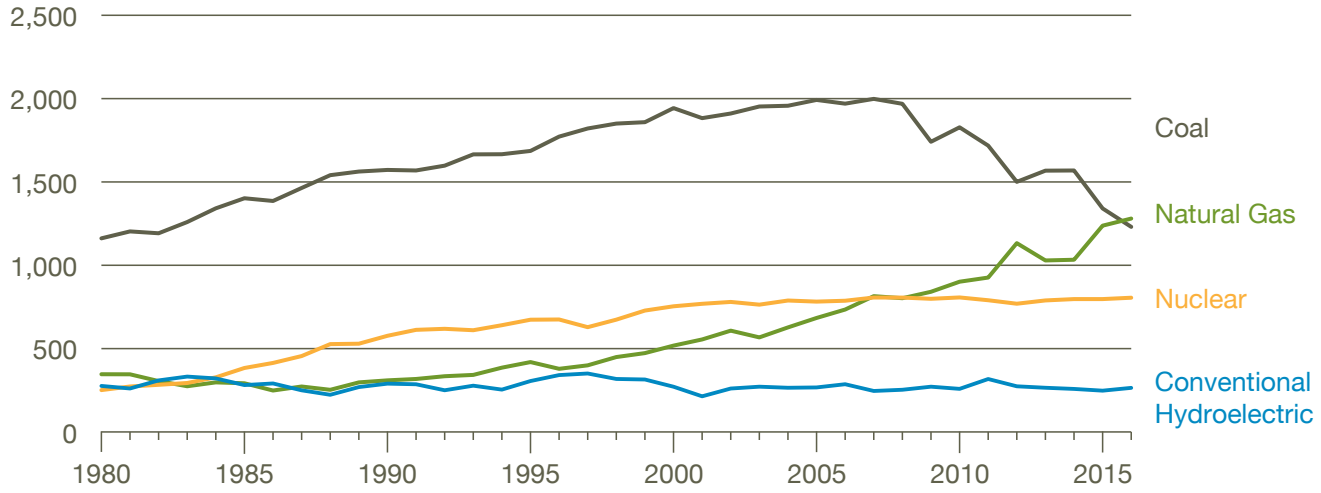

Photo © Fletcher6

[35] U.S. Energy Info. Admin., Monthly Energy Review June 2017 tbl.7.2b (2017), *available at* https://www.eia.gov/totalenergy/data/monthly/archive/00351706.pdf.

[36] *Id.*

[37] *Id.*

[38] *Id.*

[39] *See Factbox: U.S. coal-fired power plants scheduled to shut*, Reuters (May 16, 2017), https://www.reuters.com/article/us-usa-coal-retirement-factbox/factbox-u-s-coal-fired-power-plants-scheduled-to-shut-idUSKCN18C2C5 (noting that "U.S. power companies expect to retire or convert from coal to gas nearly 8,000 megawatts of coal-fired plants in 2017").

Meanwhile, renewable energy development has continued to surge. Together, wind and solar accounted for 63 percent of utility-scale capacity additions in 2016.[40] The U.S. solar industry alone added over 10 gigawatts (GW) of solar capacity in 2016, a new annual record and double the capacity added in 2015.[41] Wind energy has experienced similar record growth and now has an installed capacity of more than 80 GW.[42] A number of factors are driving deployment of renewable energy:

1. The economics of wind and solar continue to improve;[43]
2. Congress extended tax incentives for renewable energy at the end of 2015;[44] and
3. 29 states (and the District of Columbia.) have renewable portfolio standards and an additional 8 states have renewable portfolio goals.[45]

Additionally, large consumers of electricity are pursuing renewable energy options. For example, 111 companies—including leading U.S. corporations like Apple, Coca-Cola, Facebook, General Motors, Google, Microsoft, Nike, and Starbucks—have committed to 100 percent renewable electricity through an initiative called RE100.[46] These companies are entering into direct agreements for renewable energy. For example, General Motors recently purchased 50 megawatts of wind in Texas to equal the electricity needs of 16 of its U.S. facilities.[47]

A final factor contributing to emissions reductions is continued investment in energy efficiency programs by states and consumers. In 2015, state energy efficiency programs saved more than 26 million megawatt hours—almost twice the amount saved in 2010.[48] Those savings were equivalent to almost one percent of total U.S. electric demand for 2015.[49]

If EPA were to revisit its 2015 CPP modeling with updated assumptions reflecting these recent changes in the electric power system, it would find that the costs of compliance are significantly lower than previously anticipated. First, ongoing market trends are reducing electric sector emissions, narrowing the gap between business-as-usual emissions and the

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[40] U.S. Energy Info. Admin., *Renewable generation capacity expected to account for most 2016 capacity additions*, Today in Energy (Jan. 10, 2017), https://www.eia.gov/todayinenergy/detail.php?id=29492.

[41] U.S. Energy Info. Admin., *U.S. electric generating capacity increase in 2016 was largest net change since 2011*, Today in Energy (Sept. 27, 2017), https://www.eia.gov/todayinenergy/detail.php?id=30112 (noting that solar industry added 7.7 GW of utility-scale capacity and 3.4 GW of distributed capacity in 2016); U.S. Energy Info. Admin., *Wind adds the most electric generation capacity in 2015, followed by natural gas and solar*, Today in Energy (Mar. 23, 2016), https://www.eia.gov/todayinenergy/detail.php?id=25492 (showing that the solar industry added just over 5 GW of total capacity in 2015).

[42] U.S. Energy Info. Admin., *U.S. wind generating capacity surpasses hydro capacity at the end of 2016*, Today in Energy (Mar. 6, 2017), https://www.eia.gov/todayinenergy/detail.php?id=30212.

[43] *See, e.g.*, Ran Fu et al., Nat'l Renewable Energy Lab., U.S. Solar Photovoltaic System Cost Benchmark: Q1 2016 (2016) (showing a 20% decline in the cost of utility-scale photovoltaics between 2015 and 2016).

[44] Armando Gomez et al., *Congress Extends Renewable Energy Tax Credits*, Skadden, Dec. 21, 2015, https://www.skadden.com/insights/publications/2015/12/congress-extends-renewable-energy-tax-credits.

[45] Renewable Portfolio Standard Policies, Database of State Incentives for Renewables & Efficiency (Feb. 2017), http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2017/03/Renewable-Portfolio-Standards.pdf.

[46] Companies, RE100, http://there100.org/companies (last visited Sept. 27, 2017).

[47] Press Release, General Motors, GM Makes its Largest Green Energy Purchase to Date (Nov. 16, 2016), http://media.gm.com/media/us/en/gm/news.detail.html/content/Pages/news/us/en/2016/nov/1116-green.html.

[48] Compare U.S. Energy Info. Admin., Form 861, Electric Power Sales, Revenue, and Energy Efficiency (2015), (energy efficiency savings in column I of "Energy_Efficiency_2015"), with U.S. Energy Info. Admin., Form 861, Electric Power Sales, Revenue, and Energy Efficiency (2010) (energy efficiency savings in column K of "file 3_2010").

[49] U.S. Energy Info. Admin., Electric Power Annual tbl.1.1 (2016), https://www.eia.gov/electricity/annual/ (showing total sales of 3.76 billion megawatt hours in 2015).

CPP targets, meaning that fewer total tons of CO_2 would need to be abated to meet the CPP targets.[50] Second, lower renewable energy costs and natural gas prices mean that the emissions that need to be abated under the CPP can be reduced more cheaply than EPA first projected.[51]

More Recent Estimates of the Clean Power Plan's Costs

After EPA finalized the CPP and published its modeling, a number of organizations conducted additional modeling to better understand compliance options and to explore the impact of market and policy developments that occurred after EPA finalized its own data inputs. The key changes captured in the more recent modeling were Congress's extension of tax credits for electricity generated from wind and solar resources and lower natural gas price and renewable technology cost forecasts. In all cases where direct comparison to EPA's results is possible, independent analyses that incorporated these market and policy developments estimated significantly lower compliance costs than EPA did in its 2015 analysis.

Estimates Using the Same Electric Sector Model as EPA

A number of independent modeling efforts used IPM, the same model of the electric sector that EPA employed in its analysis of the CPP. These IPM studies, with key assumptions and results summarized in Table 2, are particularly useful for highlighting the effect of the changes that occurred after EPA completed its own modeling. The table focuses on mass-based compliance scenarios. Independent analyses tended to favor this compliance option, so it provides a consistent regulatory approach across model runs.

There is some variability in how the CPP was modeled across these cases. In particular, EPA modeled a mass-based scenario in which only existing sources were covered by the rule.[52] However, although the CPP's emission guidelines apply only to existing sources, the rule requires states relying on mass-based implementation to adopt measures preventing emission "leakage"—that is, the potential for power producers to respond to limits on existing sources by increasing emissions from newly constructed sources.[53]

One option for addressing such leakage is for the state to include both new and existing sources in its mass-based trading system.[54] The other model runs in Table 2 assume that states would choose this leakage-prevention strategy and include both new and existing sources under their emission caps. All else being equal, this raises projected compliance costs when compared to a compliance scenario that covers existing sources only and does not include other measures to prevent shifting of generation to new sources. In other words, had the independent groups looked only at existing sources, as EPA

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[50] To be clear, lower business-as-usual emissions reduce both the costs and the benefits of the CPP (because if fewer tons are being abated to meet the CPP targets, fewer climate and health benefits are attributable to the CPP). Because benefits do not decline *more* than costs, however, the benefits of the rule continue to significantly outweigh the compliance costs.

[51] Unlike the downward adjustment to business-as-usual emissions, the decline in per-ton abatement costs reduces the costs of the CPP without also reducing its benefits.

[52] CPP RIA, *supra* note 4, at 3-7.

[53] 80 Fed. Reg. at 64,823.

[54] *Id.* at 64,888.

did in its original modeling, their compliance cost estimates would have been even lower than shown here. Indeed, API *did* perform an existing-only run and estimated that, under that scenario, the CPP would impose no incremental costs in 2030.[55] Similarly, the Bipartisan Policy Center (BPC) estimated average annual costs of only $1 billion for an existing-only compliance scenario.[56]

Table 2: Annual Incremental Cost Estimates and Key Assumptions for CPP Modeling

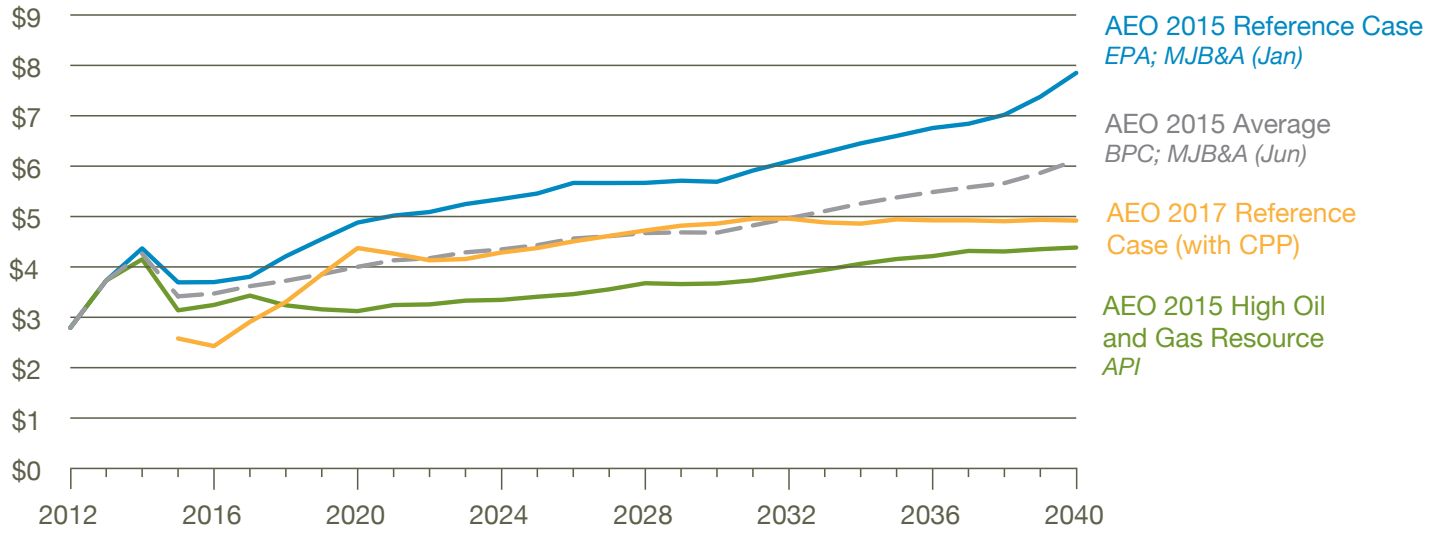
CPP Scenario	Modeling Entity	Report Date	Incremental Cost of the CPP (billion 2011$)	Natural Gas Price Forecast	Renewable Tax Credit Extension	Energy Efficiency Assumption
Mass-based (existing only)	EPA	2015	$5.1 in 2030	AEO 2015 Reference Case	No	Increasing to 1% of demand per year
Mass-based (existing + new)	MJB&A	2016 (Jan)	$7.4 in 2030	AEO 2015 Reference Case	No	1% or greater savings rate per year
		2016 (June)	$0.8 in 2030	AEO 2015 avg. of RC and High Oil and Gas Resource	Yes	1% or greater savings rate per year
	BPC	2016	≈$5.4 annual average (2022-2032)	AEO 2015 avg. of RC and High Oil and Gas Resource	Yes	No incremental EE
	API	2016	Less than $3.0 in 2030 ("market forces" scenario)	AEO 2015 High Oil and Gas Resource	No	No incremental EE

Figure 4 illustrates the differing slopes of the three natural gas price forecasts cited in Table 2. EPA's modeling used the AEO 2015 Reference Case, shown in blue, as did MJB&A's January 2016 modeling. But MJB&A's June 2016 modeling and BPC's June 2016 modeling used an average of the AEO 2015 Reference Case and the AEO 2015 High Oil and Gas Resource case, shown as a dotted line. In an October 2016 analysis, API used the AEO 2015 High Oil and Gas Resource Case, shown in green, to reflect expectations of lower natural gas prices. The alternative forecasts used by MJB&A and BPC are closer to current expectations of future natural gas prices, as reflected in EIA's AEO 2017 Reference Case, shown in yellow. The forecast used by API is lower than EIA's current expectation of future natural gas prices.

[55] *See infra* Table 4.

[56] Jennifer Macedonia et al., Bipartisan Policy Center, Modeling the Evolving Power Sector and Impacts of the Final Clean Power Plan 28 (2016), https://bipartisanpolicy.org/wp-content/uploads/2016/06/BPC-Energy-Clean-Power-Plan-Modeling.pdf.

Figure 4: AEO 2015 Natural Gas Henry Hub Spot Prices Used for Modeling and AEO 2017 for Comparison (2013$/MMBtu)



Note: *Reference Case used in EPA and January 2016 MJB&A modeling. Average used in June 2016 MJB&A and BPC modeling. High Oil and Gas Resource used in API modeling.*

M.J. Bradley & Associates

MJB&A published two rounds of IPM modeling of the final CPP, first in January 2016 and again in June 2016. The January 2016 modeling used the same natural gas price forecast as EPA's analysis and, like EPA's analysis, did not incorporate the congressional extension of renewable energy tax credits.[57] The June 2016 modeling, by contrast, incorporated the tax credits and used a natural gas price forecast based on the average of the AEO 2015 Reference Case and High Oil and Gas Resource Case, to approximate expected updates to the natural gas price forecast.[58]

A side-by-side comparison of these two sets of results provides a particularly clear illustration of the extent to which taking into account recent energy sector developments, while holding other key assumptions constant, reduces expected CPP compliance costs.

[57] M.J. Bradley & Assocs., EPA's Clean Power Plan: Summary of IPM Modeling Results 5 (Jan. 2016), http://www.mjbradley.com/sites/default/files/MJBA_CPP_IPM_Summary.pdf.

[58] M.J. Bradley & Assocs., EPA's Clean Power Plan: Summary of IPM Modeling Results with ITC/PTC Extension 5 (June 2016), http://www.mjbradley.com/sites/default/files/MJBA_CPP_IPM_Report_III_2016-06-01_final_0.pdf.

Table 3: MJB&A Estimates of Annual Incremental Compliance Costs in 2030 (billion 2012$)[59]

Compliance Scenario Description	2030	
	January 2016 Runs	June 2016 Runs
Mass-based (existing + new), Intra-state trading, Energy efficiency increased to 1% per year	$7.4	$0.8
Mass-based (existing + new), Interstate trading, Extend current energy efficiency	$8.2	$2.3
Mass-based (existing + new), Interstate trading, Energy efficiency increased to 1% per year	$7.0	$1.5
Mass-based (existing + new), Interstate trading, Energy efficiency increased to 2% per year	$4.5	$2.2
Rate-based, Interstate trading, Energy efficiency increased to 1% per year	$5.7	$3.7

The first scenario in Table 3 (Mass-based (existing + new), Intra-state trading, Energy efficiency increased to 1% per year) is the most comparable to the mass-based compliance scenario in EPA's 2015 regulatory impact analysis. The major difference is that the MJB&A case includes both new and existing sources in the compliance program while EPA included only existing sources, and this difference likely explains why MJB&A's January 2016 estimate of a $7.4 billion cost for this scenario is higher than EPA's $5.1 billion estimate for its mass-based compliance scenario. After MJB&A updated its assumptions in June 2016 to include renewable energy tax credits and lower natural gas price forecasts, however, its estimated costs for this scenario declined by almost 90 percent to $0.8 billion—a level far below EPA's projection, even with new sources included.

The final scenario in Table 3 (Rate-based, Interstate trading, Energy efficiency increased to 1% per year) is the closest to EPA's rate-based scenario. One significant difference is that, unlike EPA, the MJB&A case did not include states with existing mass-based trading programs (California and the Regional Greenhouse Gas Initiative states) in the rate-based framework.[60] This is likely part of the reason that MJB&A's January 2016 estimate of a $5.7 billion cost for this scenario is lower than EPA's $8.4 billion estimate for its rate-based compliance scenario. As with the mass-based scenario, however, once MJB&A updated its assumptions in June 2016 to reflect renewable energy tax credits and lower natural gas price forecasts, its estimated costs for the rate-based scenario fell substantially—in this case, by more than 30 percent.

Bipartisan Policy Center

In June 2016, the Bipartisan Policy Center (BPC) released an IPM-based analysis of the CPP.[61] The BPC modeling included the congressional extension of the renewable energy tax credits and natural gas prices that anticipated reductions in forecast prices by averaging the AEO 2015 Reference Case and the AEO 2015 High Oil and Gas Resource Case.[62]

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[59] M.J. Bradley & Assocs., Supplemental Data: System Costs, Average Bills, and Emissions (2016), http://mjbradley.com/sites/default/files/MJBA_IPM_Results_TotalUS.xlsm.

[60] M.J. Bradley & Assocs., EPA's Clean Power Plan: Summary of IPM Modeling Results with ITC/PTC Extension 6 (June 2016).

[61] Jennifer Macedonia et al., Bipartisan Policy Ctr., Modeling the Evolving Power Sector and Impacts of the Final Clean Power Plan (2016), https://bipartisanpolicy.org/wp-content/uploads/2016/06/BPC-Energy-Clean-Power-Plan-Modeling.pdf.

[62] *Id.* at 14.

BPC found that many states were already on track to meet CPP targets in the initial years of the program (i.e., beginning in 2022) without any incremental compliance expenditures, given the low price of natural gas, the extension of the tax credits, and state-specific policies (e.g., renewable portfolio standards).[63] BPC estimated that, due to these factors, carbon emissions would continue declining even in the absence of the CPP. However, BPC concluded that the CPP would accelerate the decline in emissions and encourage increased investment in renewables.[64]

Unlike EPA's and MJB&A's estimates, the BPC results were presented in terms of average annual compliance costs, rather than as a 2030 compliance cost.[65] The analysis estimated that a mass-based existing-only approach would cost an average of $1 billion (2012$) per year across the compliance period (i.e., from 2022–2032).[66] Adding new sources to BPC's mass-based scenario raised estimated costs to an average of $5.5 billion per year.[67] Finally, BPC projected that a rate-based scenario would cost an average of $9 billion per year.[68]

BPC's runs included significantly less energy efficiency than EPA. While EPA assumed energy efficiency would grow to about one percent of electricity sales per state per year, BPC assumed energy efficiency would not be used for compliance in its primary policy runs.[69] This assumption removes a low-cost compliance option that was included in EPA's analysis.[70] Despite this, with the updated assumptions, BPC found average annual compliance costs for its existing plus new mass-based scenario that were comparable to EPA's 2030 estimates for an existing-only scenario. And BPC's projected average annual costs for an existing-only scenario are significantly lower than EPA's 2030 estimate, even without EPA's higher energy efficiency assumptions.

American Petroleum Institute

In October 2016, API published an IPM-based analysis of the CPP.[71] The analysis estimated costs for three compliance pathways: mass-based for existing sources, mass-based for existing and new sources, and rate-based.[72] API used the AEO 2015 High Oil and Gas Resource Case for its natural gas price forecast.[73] This forecast results in the lowest natural gas prices of any of the modeling efforts described here, as shown in Figure 4. The modeling did not include the congressional extension of the renewable energy tax credits.[74] Each compliance pathway was then modeled assuming three different scenarios:

- Compliance based on the model's least-cost compliance solution;
- Compliance based on a combination of state-specific energy efficiency targets and the model's least-cost compliance solutions; and
- Compliance based on a combination of state-specific renewable energy targets and the model's least-cost compliance solutions.[75]

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[63] *Id.* at 5.
[64] *Id.*
[65] *Id.* at 28.
[66] *Id.*
[67] *Id.*
[68] *Id.*
[69] *Id.* at 59–60.
[70] *Id.* (noting that cost projections for all scenarios decrease when incremental energy efficiency is assumed).
[71] Am. Petroleum Inst., EPA Clean Power Plan Compliance Pathways—Modeled Generation, Capacity and Costs (2016), http://www.api.org/~/media/Files/Policy/Natural-Gas-Solutions/CPP_National_Results.pdf.
[72] *Id.* at 3.
[73] *Id.* at 11.
[74] *Id.* at 14.
[75] *Id.* at 4.

Assuming a mass-based compliance scenario, covering existing sources only and with compliance determined by market forces (i.e., assuming that states adopted no renewable energy or energy efficiency mandates beyond those already on the books), API estimated that the CPP would impose no incremental compliance costs in 2030.[76] Adding new sources raised the projected annual cost to $3 billion, and switching to rate-based compliance brought the expected annual cost to $8 billion (see Table 4).[77]

API found higher costs under compliance scenarios with increased state mandates for energy efficiency and renewable energy.[78] But the CPP does not require any state to adopt such mandates. Additionally, API did not include the Congressional extension of the renewable energy tax credits, which would lower the projected costs of renewable deployment.

Table 4: API Estimates of Annual Incremental Compliance Costs in 2030 (billion 2012$)*

Compliance Scenario	Market Forces	Increased Energy Efficiency Mandates	Increased Renewables Mandates
Mass-based (existing only)	$0	$11	$16
Mass-based (existing + new)	$3	$12	$16
Rate-based	$8	$12	$16

*Dollar values estimated based on a graphic on slide 20 of API's published results

Estimates Using Alternative Electric Sector Models

In addition to the modeling completed using ICF's IPM, a number of other groups have modeled the CPP using in-house models. Those groups include the Nicholas Institute for Environmental Policy Solutions at Duke University (Nicholas Institute), the Rhodium Group, Synapse Energy Economics, and NERA Economic Consulting. It is more difficult to draw direct comparisons between the cost indicators in these analyses and those in EPA's original RIA, but they do provide alternative projections of compliance costs based on models other than IPM.

Nicholas Institute for Environmental Policy Solutions

In July 2016, the Nicholas Institute published a working paper on the impact of the CPP on the electric sector.[79] The working paper included the results of a series of model runs using the Nicholas Institute's Dynamic Integrated/Economy/Energy/Emissions Model to evaluate the impact of the CPP on generation mix, emissions, and industry costs.[80] The analysis focused on three compliance scenarios: mass-based for existing sources, mass-based for existing and new sources, and rate-based.[81] The Nicholas Institute created a "Standard Assumptions" set of model runs that included similar inputs to other studies completed since EPA's 2015 analysis, including natural gas prices at an average of EIA's Reference Case and High Oil and Gas Resource Case (consistent with the MJB&A and BPC assumption in Figure 4) and the extensions of the renewable energy tax credits.[82]

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[76] *Id.* at 20.
[77] *Id.*
[78] *Id.*
[79] Martin T. Ross et al., *Ongoing Evolution of the Electricity Industry: Effects of Market Conditions and the Clean Power Plan on States* (Nicholas Institute, Working Paper NI WP 16-07, 2016), https://nicholasinstitute.duke.edu/sites/default/files/publications/ni_wp_16-07_final.pdf.
[80] *Id.* at 1.
[81] *Id.* at 16.
[82] *Id.* at 12, 14.

Nationally, the Nicholas Institute calculated cumulative compliance costs through 2040 of $12.1 billion under a mass-based approach that covered new and existing sources, $15.4 billion under a rate-based approach, and $1.9 billion under a mass-based approach that covered only existing sources, as shown in Table 5.[83] While the Nicholas Institute did not publish costs for 2030 or an annualized equivalent of costs, the researchers did estimate costs as a percentage increase in generation costs through 2040.[84] As summarized in Table 5, none of the scenarios increases total generation costs by more than one percent. In 2030, EPA estimated that a rate-based program would increase total power sector generating costs, including costs associated with energy efficiency, by about 4 percent and that a mass-based existing-only program would increase total power sector generating costs, including energy efficiency by 2.5 percent.[85]

To better understand the sensitivity of results to gas prices, renewable costs, and demand growth, the researchers also completed runs that varied these assumptions. The results of these sensitivities suggested that low gas prices could reduce policy costs to almost zero under rate- or mass-based scenarios.[86]

Table 5: Nicholas Institute Estimates of Cumulative Compliance Costs as Change in Present Value to 2040

Compliance Scenario	Compliance Cost (billion $)	Compliance Cost (% increase in generation costs)
Mass-based (existing)	$1.9	0.1%
Mass-based (existing + new)	$12.1	0.5%
Rate-based	$15.4	0.7%

Rhodium Group

In May 2016, the Rhodium Group, supported by the Center for Strategic & International Studies, released an assessment of the CPP.[87] Rhodium modeled two compliance scenarios—a rate-based scenario and a mass-based scenario that included both existing and new sources—using an in-house version of the EIA's National Energy Modeling System (NEMS) model called RHG-NEMS.[88] Rhodium Group used the same AEO 2015 natural gas price forecast as EPA, but, unlike EPA, included the extension of the renewable energy tax credits.[89]

Rhodium Group projected that cumulative system costs during the compliance period (2022-2030) would be 8 percent higher under the rate-based compliance scenario compared to the reference case, but only 2 percent higher under the mass-based compliance scenario compared to the reference case.[90] Rhodium Group did not publish its cost estimates; it reported only the cumulative percentage increase relative to its reference case. As a result, its estimates of the CPP's costs cannot be compared with EPA's estimates.

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[83] *Id.* at 23-26.
[84] *Id.* at 3-4.
[85] Calculated as 2030 incremental costs divided by 2030 base case costs. CPP RIA, *supra* note 4, tbl.3-9.
[86] *Id.* at 26.
[87] John Larsen et al., Ctr. for Strategic & Int'l Studies / Rhodium Grp., Assessing the Final Clean Power Plan: Energy Market Impacts (2016), http://rhg.com/wp-content/uploads/2016/05/AssessingCleanPowerPlan_EMI.pdf.
[88] *Id.* at 3.
[89] *Id.*
[90] *Id.* at 5.

Synapse Energy Economics

In March 2016, Synapse published an update to a January 2016 report entitled "Cutting Electric Bills with the Clean Power Plan: EPA's Greenhouse Gas Reduction Policy Lowers Household Bills."[91] Synapse conducted its analysis with an adapted version of the National Renewable Energy Laboratory's Regional Energy Deployment System (ReEDS) model.[92] Like EPA, Synapse relied on natural gas price forecasts from the AEO 2015 Reference Case, but, unlike EPA, its modeling incorporated the renewable energy tax credit extensions.[93] Synapse examined three scenarios for the U.S. electric sector: (1) a reference case; (2) a "Synapse-CPP" case that emphasized cost-effective energy efficiency and renewables as a compliance pathway; and (3) a "Low-EE-CPP" case that emphasized renewables and expansion of natural gas generation as a compliance pathway.[94]

The Synapse Report assesses the relative compliance costs of its two compliance pathways, finding that total system costs in 2030 are 10 percent higher in the Low-EE-CPP case than in the Synapse-CPP case that includes more energy efficiency measures.[95] It does not, however, report total system costs for either scenario relative to its reference case. As a result, its estimates of the CPP's costs cannot be compared with EPA's estimates.

NERA Economic Consulting

In November 2015, NERA Economic Consulting released an economic analysis of the CPP that relied on NERA's in-house NewERA model.[96] NERA used the same forecast of natural gas prices as EPA (AEO 2015 Reference Case) and higher assumptions for the cost of renewable energy and energy efficiency than EPA.[97] In addition, NERA did not include the extension of the renewable energy tax credits, which Congress approved after NERA published its modeling. These key assumptions, along with the way that NERA accounts for emissions allowances and energy efficiency costs, result in significantly higher estimated costs than found by EPA or the other analyses discussed here.[98]

NERA reported its estimated costs as the net present value of the change in energy sector expenditures from 2022 to 2033 (calculated using a discount rate of five percent).[99] Under a massed-based program. NERA estimated a cumulative increase in expenditures of $220 to $292 billion ($2015), with average annual expenditures of $29 to $39 billion.[100] Under a rate-based scenario, NERA estimated a cumulative energy sector expenditure increase of $192 billion.[101]

In addition to assuming higher costs for compliance strategies (i.e., costlier natural gas, renewable energy, and energy efficiency), NERA also included costs paid for emissions allowances as part of its estimate of total energy sector

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[91] Allison P. Knight et al. Synapse Energy Economics, Inc., Cutting Electric Bills with the Clean Power Plan: EPA's Greenhouse Gas Reduction Policy Lowers Household Bills: March 2016 Update (2016), http://www.synapse-energy.com/sites/default/files/cutting-electric-bills-cpp-march2016.pdf.

[92] *Id.* at 10.

[93] *Id.* at 14.

[94] *Id.* at 1.

[95] *Id.* at 8.

[96] David Harrison et al., NERA, Energy and Consumer Impacts of EPA's Clean Power Plan (2015), http://www.nera.com/content/dam/nera/publications/2015/NERA_ACCCE_CPP_Results_Nov72015.pdf.

[97] *Id.* at 3; Noah Kaufman & Eleanor Krause, *The Economic Impacts of the Clean Power Plan: How Studies of the Same Regulation Can Produce Such Different Results* 3–5 (World Res. Inst. Working Paper, Jan. 2017) (showing that NERA's estimates of energy efficiency and renewable costs are significantly higher than those used by EPA and other organizations).

[98] Kaufman & Krause, *supra* note 97, at 8 ("The NERA study uses mostly pessimistic assumptions . . . and arrives at highly pessimistic results . . . .").

[99] Harrison et al., *supra* note 96, at 6.

[100] *Id.*

[101] *Id.*

expenditures.[102] If allowances are freely allocated to generators, however, allowance sales are merely a means of efficiently distributing emission-reduction costs among participants in the electric sector (because any losses incurred by allowance purchasers are entirely offset by corresponding gains for allowance sellers). They do not result in any additional expenditure by the electric sector as a whole, and adding them to emission-reduction investments overstates total compliance costs.

If allowances were auctioned by state governments, the money paid for the allowance might represent an additional expenditure by the energy sector, above and beyond its total investment in actual emission reductions. But the CPP does not require states to include auctions as part of their implementation of the rule.[103] Accordingly, EPA's own modeling assumed that allowances would be freely allocated to generators.[104] Furthermore, even if a state did choose to auction allowances, the money paid by plant owners to the state government in exchange for allowances would not, under longstanding White House guidance on cost-benefit analysis, qualify as a regulatory "cost." Instead, it would be considered a "transfer payment" that should be discussed in a separate analysis of the rule's distributional effects.[105]

Using NERA's data, removing the allowance value from the compliance cost estimate reduces the estimated cumulative expenditures by more than 50 percent, from $292 billion to $141 billion, implying an annual cost of about $19 billion. Updates to other inputs and assumptions would further reduce the estimated expenditures.

Conclusion

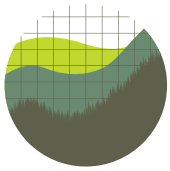
Developments in the electric sector since the EPA estimated the costs and benefits of the Clean Power Plan have accelerated the shift to a cleaner generation mix. As a result, multiple analyses conducted by independent, non-governmental entities subsequent to EPA's original assessment have found that the rule's emission targets could be achieved for significantly less than the agency projected in 2015.

[102] *Id.* at 24.

[103] Auctions can, however, increase the efficiency of allowance trading programs. *See* Dallas Burtraw et al., *The Effect of Allowance Allocation on the Cost of Carbon Emission Trading* (Resources for the Future Discussion Paper 01-30, 2001).

[104] CPP RIA, *supra* note 4, at 3-36.

[105] *See* Office of Mgmt. & Budget, Circular A-4, p. 38 (2003) ("You should not include transfers in the estimates of the benefits and costs of a regulation. Instead, address them in a separate discussion of the regulation's distributional effects. Examples of transfer payments include the following: . . . Indirect taxes and subsidies.").



Institute *for*
Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

Institute for Policy Integrity
New York University School of Law
Wilf Hall, 139 MacDougal Street, New York, New York 10012
policyintegrity.org